Onan

MAJOR SERVICE MANUAL

FOR

AT

AUTOMATIC TRANSFER SWITCHES 800 THROUGH 1750 AMPERES

FOR DISTRIBUTOR, DEALER AND INTERNAL USE ONLY

962-0502

4-75
Printed in U.S.A.

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GENERAL INFORMATION

ONAN SERVICE MANUAL

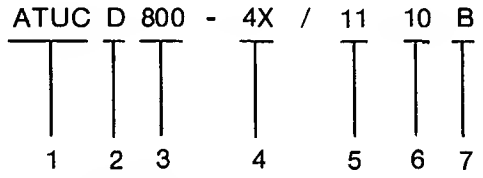
This manual contains a detailed operation description, adjustments, repair, and troubleshooting information of 800, 1200, and 1750 ampere automatic transfer switches. Whenever troubleshooting or planning a repair, remember the generator set, automatic transfer switch and commercial source are all interdependent. Take all the necessary and normal safety precautions and then decide whether the automatic transfer switch, generator set or commercial power source is the source of problems. A troubleshooting section is included in this manual.

Throughout the text, front of the automatic transfer switch is the door side. Left and right are determined when facing the cabinet doors. Metric equivalent of U.S. customary unit is given in parentheses where applicable. AT-C and AT-D automatic transfer switches are for two-wire remote control starting (see *Model Number System* following).

Because almost all 800- through 1750-ampere automatic transfer switches are not used with three-wire start generator sets, the AT-E model (3-wire, 12-volt start control) is not described in this manual except for model number explanation given below.

MODEL NUMBER SYSTEM

Following is a typical model number with explanations of the different parts.



1. Series Identification:

ATUC - two-wire start, 24 volts.
ATUD - two-wire start, 12 volts.
ATUE - three-wire start, 12 volts.

"U" indicates UL listing.

2. Transfer Switch and Cabinet Combination Code.

3. Current Rating (amperes).

4. Voltage Code:

1 - 120 volts, single phase, 60 Hz.
2 - 240 volts, single phase, 60 Hz.
3 - 120/240 volts, single phase, three wire, 60 Hz.
4 - 120/208 volts, three phase, four wire, 60 Hz.
4X - 277/480 volts, three phase, four wire, 60 Hz.
5D - 120/240 volts, three phase, four wire, delta, 60 Hz.
9X - 347/600 volts, three phase, four wire, 60 Hz.

For 50-hertz operation, number "5" prefix is used. . .example is 54X.

5. Control Accessory Group:

Groups 01 Through 05

Accessory	Group				
	01	02	03	04	05
Standard Items*	X	X	X	X	X
Start Time Delay	W	W	W	X	X
Transfer Time Delay	W	W	W	W	X
Retransfer Time Delay	W	X	X	X	X
Stop Time Delay	W	W	W	W	X
Exerciser Clock	W	W	X	X	X

X = Supplied standard.
W = Wire-in package available.

* - Includes voltage sensing relays, normal-test switch, disconnect plug, area protection terminals, and engine start-run contacts.

Groups 11 Through 15

Accessory	Group				
	11	12	13	14	15
Standard Items*	X	X	X	X	X
Start-Stop Time Delay	X	X	X	X	P
Transfer Time Delay	P	P	P	X	P
Retransfer Time Delay	W	X	X	X	P
Battery Charger Module	X	X	X	X	P
Battery Voltage Sensor	W	W	W	X	P
Undervoltage Sensor (all lines)	X	X	X	X	X
Overvoltage Sensor (line)	W	W	W	X	P
Exerciser Clock	W	X	X	X	W
Manual Retransfer Switch	W	W	X	W	X

X = Supplied standard.
P = Plug-in module package available.
W = Wire-in package available.

* - Includes 2-amp charger, normal-test switch, with load — without load selector switch, disconnect plug, area protection terminals, overcrank lamp on ATUE only, and engine start-run signal.

6. Meter-Lamp Combination:

Accessory	Group															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
Charge Ammeter	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Overcrank Lamp (AT-E only)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Normal-Emergency Lamps		X		X		X		X		X		X		X		X
Battery Voltage Lamps			X	X			X	X			X	X			X	X
AC Voltmeter					X	X	X	X								
Full Meter Panel*									X	X	X	X				
Running Time Meter													X	X	X	X

X = Supplied standard.

* - Includes voltmeter, ammeter(s), running time meter, frequency meter and current transformer.

7. Specification Letter: Advances with production modification.

SAFETY PRECAUTIONS

This manual includes the following symbols to indicate potentially dangerous conditions to the operator or equipment. Read the manual carefully and know when these conditions exist. Then take the necessary steps to protect personnel and the equipment.

WARNING **Onan uses this symbol throughout this manual to warn of possible serious personal injury.**

CAUTION **This symbol refers to possible equipment damage.**

The automatic transfer switch has components with high voltages which present serious shock hazards. For this reason, read the following suggestions:

Keep the automatic transfer switch cabinet(s) closed and locked. Make sure authorized personnel only have the cabinet keys.

Always move the operation selector switch on the generator set or automatic transfer switch to "STOP", disconnect the starting batteries of the generator set, and remove AC line power to the automatic transfer switch before performing maintenance or adjustments of the automatic transfer switch (unless specified otherwise in the instructions — *then only using extreme caution* due to danger of shock hazard).

Before using the disconnect plug, if equipped, for de-energizing the control panel, be sure to place the operation selector switch on the generator set or automatic transfer switch to the "STOP" position. Neglect of this procedure results in set starting and energizing of the transfer switch generator side.

Use rubber insulative mats placed on dry wood platforms over floors which are metal or concrete when working on any electrical equipment. Do not wear damp clothing (particularly wet shoes) or allow skin surfaces to be damp when handling any electrical equipment.

Jewelry is a good conductor of electricity and should be removed when working on the electric equipment.

Do not work on this equipment when mentally or physically fatigued.

OPERATION DESCRIPTION

This detailed operation description is intended as an aid in understanding and servicing the automatic transfer switch. For a simple explanation of the automatic transfer switch's functions and descriptions of various components, see the operator's manual.

Two operation descriptions are given, one for automatic transfer switches with relay-type control accessory panels (see *AT's WITH CONTROL PANEL GROUPS 01 THROUGH 05),* and one for those with modular-type control accessory panels (see *AT's WITH CONTROL PANEL GROUPS 11 THROUGH 15).* Follow the appropriate description. Individual accessory items are discussed after the basic operation description of each type control accessory panel.

The schematic wiring diagrams for the automatic transfer switches are divided into three groups: meter-lamp panel, control accessory panel, and transfer switch cabinet. Each diagram is also divided into three parts: a pictorial wiring diagram, a schematic, and a parts list on the right-hand side.

Wiring diagrams referenced in the operation description are shown at the end of this section.

If you wish to follow the schematic diagrams as operation is described, note that you have to use and follow all three schematic diagrams. Numbers of the wiring diagrams will be noted in the description.

AT'S WITH CONTROL PANEL GROUPS 01 THROUGH 05

NORMAL OPERATION

Under normal conditions, the commercial line supplies power to the load through the closed K1 contacts lines A, B, and C shown in schematic diagram 626D0149. Two AC motors, one on line side (M) and one on generator side (G), operate the transfer switch. Relay K8 is energized whenever there is commercial line power from normal line A, which connects to terminal TB14-L1, through relay K8, to terminal TB14-4, terminal J1-W of receptacle J1. Terminal J1-W connects to terminal W of disconnect plug P1 (drawing 626C0071), which connects to normally open K3 contacts (5-6) and back to Y terminal of receptacle J1 (drawing 626D0149). J1-Y connects to terminal TB14-L2 which connects to line B (L2) of transfer switch K1. Once the mechanically-held transfer switch is picked up by the normal line, it is mechanically held in that position.

It is the contacts closing and opening of relay K8 which allows one power source or the other to operate the transfer switch motors (see *Power Outage* and *Restoration of Normal Line*).

POWER OUTAGE

When a power outage occurs (normal line), voltage from lines B (L2) and C (L3) (drawing 626D0149), through disconnect plug terminals Y and Z disappears (drawing 626C0071). Relay K6 is de-energized and contacts K6 (3-5) open. Relay K3 is de-energized, contacts K3 (5-6) open and contacts K3 (1-3) close. Relay K8 (drawing 626D0149) and relay K7 (drawing 626C0071) are also de-energized. Contacts K7 (1-5) close and complete the circuit between TB1-B+ and TB1-RMT to apply battery voltage to the remote start circuit, signaling the generator set to start.

The AC running time meter is energized whenever the generator set operates. Generator line A (LL1) (drawing 626D0149) supplies power through TB14-LL1, TB6-6, TB7-6 (drawing 626C0164), to running time meter M12-1. Generator line C (LL3) (drawing 626D0149) supplies power through TB7-9 (drawing 626C0164), to running time meter M12-2.

Generator output voltage completes a circuit from the output line A (LL1) (drawing 626D0149), TB14-LL1, TB6-6 (drawing 626C0071), TB6-11 and -12, relay K4, resistor R4, TB6-7 (drawing 626D0149), TB14-LL2, to generator output line B (LL2). Relay K4 (drawing 626C0071) is energized and closes contacts K4 (3-4).

This completes a circuit from line A (LL1) (drawing 626D0149), TB6-6 (drawing 626C0071), contacts K4 (3-4), relay bypass K3 (L3-5), contacts K3 (1-3), TB6-8 (drawing 626D0149), TB14-9, closed K8 contacts, TB14-8, switch S8, TB14-6, transfer switch motor M, closed contacts MCO₀ and GB2, TB14-5, closed K8 contacts, TB14-11, TB14-LL2, to generator line B (LL2). Transfer switch motor M operates and opens the line-side K1 contacts.

When transfer switch motor M operates, contacts MB1 and MB2 close. A circuit is completed from TB14-6 (from generator line A, same as for switch motor M), contacts GCOc and MB2, TB14-5, closed K8 contacts, TB14-11, TB14-LL2, to generator line B (LL2). Transfer switch motor G operates, closes the K2 contacts and connects the load to the generator set.

AREA PROTECTION

Onan automatic transfer switches have provisions for connecting area protection equipment. The normally-closed output terminal of the area protection equipment connects to terminals TB1-4 and -5 (see drawing 626C0071). A jumper between these two terminals must be removed before the protection equipment will operate the circuit.

The area protection equipment opens the circuit between TB1-4 and -5 which removes AC input voltage from relay K3 and relay K7. Relay contacts K3 (5-6) open and contacts K3 (1-3) close. Open contacts K3 (5-6) break the circuit through P1-W, J1-W (drawing 626D0149), TB14-4, to de-energize relay K8.

Relay K7 (drawing 626C0071) de-energizes, contacts K7 (1-5) close to connect battery positive voltage from TB1-B+ to the remote start terminal (TB1-RMT). The generator starts and runs.

Generator output voltage completes a circuit from output line A (LL1) (drawing 626D0149), TB14-LL1, TB6-6 (drawing 626C0071), TB6-11 and -12, relay K4, resistor R4, TB6-7 (drawing 626D0149), TB14-LL2, to generator output line B (LL2). Relay K4 (drawing 626C0071) is energized and closes contacts K4 (3-4). A circuit is now complete from generator line A (LL1) (drawing 626D0149), TB14-LL1, TB6-6 (drawing 626C0071), closed contacts K4 (3-4), relay bypass K13 (L3-5), contacts K3 (1-3), TB6-8 (drawing 626D0149) TB14-9, closed K8 contacts, TB14-8, switch S8, TB14-6, transfer switch motor M, closed contacts MCOo and GB2, TB14-5, closed K8 contacts, TB14-11, TB14-LL2, to generator line B (LL2). Motor M operates and opens the line-side K1 contacts.

When transfer switch motor M operates, contacts MCOc, MB1 and MB2 close. A circuit is completed from TB14-6 (from generator line A, same as for motor M), through transfer switch motor G, contacts GCOc and MB2, TB14-5, K8 contacts, TB14-11, TB14-LL2, to generator line B (LL2). Motor G operates, closes the K2 contacts and connects the load to the generator set.

When area protection equipment closes the circuit between TB1-4 and -5 (drawing 626C0071), interposing line relay K3 is energized as described under *Restoration of Normal Line*.

RESTORATION OF NORMAL LINE

When the normal line returns, it energizes relay K6 (drawing 626C0071) which closes contacts K6 (3-5). A circuit is completed from normal line B (L2) (drawing 626D0149), TB14-L2, J1-Y, P1-Y (drawing 626C0071), switch S1, TB1-5, TB1-4, contacts K6 (5-3), relay bypass K10 (8-7), relay K3, P1-X, J1-X (drawing 626D0149), TB14-L1, to normal line A (L1). Relay K3 is energized closing contacts K3 (5-6) and opening K3 (1-3) contacts. Contacts K3 (5-6) close a circuit from P1-W, J1-W (drawing 626D0149), TB14-4, through relay K8, TB14-L1, to normal line A (L1). Relay K8 is energized and closes its normally-open contacts.

Power from terminal B (L2) now completes a circuit from TB14-4 through closed K8 contacts, TB14-7, closed contacts MB1 and GCOo, through transfer switch motor G, TB14-6, switch S8, TB14-8, closed K8 contacts, TB14-L1, to line A (L1). Motor G operates, opens the K2 contacts removing the load from the generator set.

When transfer switch motor G operates, contacts GCOc, GB1 and GB2 close. A circuit is completed from TB14-7 (from line B, same as for motor G), closed contacts GB1 and MCOc, transfer switch motor M, TB14-6, switch S8, TB14-8, closed K8 contacts, TB14-L1, to line A (L1). Motor M operates, closes K1 contacts connecting the load to the normal line.

At the same time, relay K3 is energized from lines A and B (drawing 626C0071), relay K7 is energized, contacts K7 (1-5) open to remove the B+ from the remote terminal (RMT) and the generator set stops.

SIMULATION OF POWER OUTAGE

To ensure the equipment is ready to perform if an actual power outage occurs, the operator should periodically simulate a power outage to keep the fuel system filled and battery charged. The Onan automatic transfer switch has two switches to provide a choice of testing or exercising the generator set with load or without load.

Without Load

To test the generator set without load, place the selector switch S2 in the "TEST" position. This completes a circuit from TB1-B+ (drawing 626C0071), through selector switch S2 (3-2) to the remote (TB1-RMT) line. This signals the generator set to start and run unloaded as long as the switch is in the "TEST" position. To stop the generator set, return selector switch S2 to "NORMAL."

With Load

To test the generator set under actual operating conditions, open test transfer switch S1 (drawing 626C0071). Start relay K7 de-energizes, relay K7 contacts (1-5) close to connect battery positive from TB1-B+ to the remote terminal (RMT). The generator set starts and runs.

Relay K3 is also de-energized when switch S1 is opened. Contacts K3 (5-6) open, and open the circuit through P1-W, J1-W (drawing 626D0149) and TB14-4 to de-energize relay K8. Normally-open K8 contacts open to remove the transfer switch motors from the normal power source.

As the generator set comes up to speed, generator output from generator line A (LL1) completes a circuit through TB14-LL1, TB6-6 (drawing 626C0071), TB6-11, TB6-12, relay K4, resistor R4, TB6-7 (drawing 626D0149), TB14-LL2, to generator line B (LL2). Relay K4 operates (drawing 626C0071) closing contacts K4 (3-4).

A circuit is now completed through contacts K4 (3-4) (drawing 626C0071), relay bypass terminals K13 (L3-5), contacts K3 (1-3), TB6-8, TB14-9, closed K8 contacts, TB14-8, through switch S8, TB14-6, transfer switch motor M, closed contacts MCOo and GB2, TB14-5, closed K8 contacts, TB14-II, TB14-LL2, to generator line B(LL2). Motor M operates and opens the line-side K1 contacts.

When transfer switch motor M operates, contacts MCOc, MB1, and MB2 close. A circuit is completed from TB14-6 (from generator line A, same as for motor M), through transfer switch motor G, contacts GCOc and MB2, K8 contacts, TB14-11, TB14-LL2, to generator line B (LL2). Motor G operates, closes the K2 contacts, and connects the load to the generator set.

To end the test and retransfer the load back to the normal line, close test transfer switch S1 (drawing 626C0071). This completes a circuit from line C (L3) (drawing 626D0149), through TB14-L3, J1-Z, P1-Z (drawing 626C0071), relay K6, P1-Y, J1-Y (drawing 626D0149), TB14-L2, to normal line B (L2). Relay K6 operates (drawing 626C0071), completing a circuit from P1-Y, through switch S1, TB1-5 and -4, K6 contacts (3-5), relay bypass assembly K10 (8-7), relay K3, P1-X, J1-X (drawing 626D0149), TB14-L1, to normal line A (L1). Relay K3 operates (drawing 626C0071), contacts K3 (5-6) close to complete a circuit from line B (L1) to P1-W, J1-W (drawing 626D0149), TB14-4, relay K8, TB14-L1, to line A (L1). Relay K8 operates, closes its normally-open contacts to connect AC voltage from line A (L1), TB14-L1, closed K8 contacts, TB14-8, switch S8, TB14-6, transfer switch motor G, closed contacts GCOo and MB1, TB14-7, closed K8 contacts, TB14-4, J1-W, P1-W (drawing 626C0071), K3 (6-5), P1-Y, J1-Y (drawing 626D0149), TB14-L2, to line B (L2). Motor G operates, opens the K2 contacts removing the load from the generator set.

When transfer switch G operates, contacts GCOc, GB1 and GB2 close. A circuit is completed from TB14-6 (from line A, same as for motor G), through transfer switch motor M, closed contacts MCOc and GB1, TB14-7, closed K8 contacts, TB14-4, J1-W, P1-W (drawing 626C0071), contacts K3 (6-5), P1-Y, J1-Y (drawing 626D0149), TB14-L2, to line B (L2). Motor M operates, closes the K1 contacts connecting the load to the normal line. Start-stop relay K7 (drawing 626C0071), energized at the same time as relay K3, opens the contacts K7 (1-5) removing B+ from the remote terminal (RMT) and stopping the generator set.

AUXILIARY CONTACTS

Small switches, mounted on line and generator side of the transfer switch, provide dry contacts to indicate transfer switch position. Drawing 626D0149 shows the K1 auxiliary contacts MB3 connected to TB13 terminals MNO, MC, and MNC. The normally open contact connects to terminals MNO and MC, the normally closed contact connects to terminals MC and MNC.

The K2 auxiliary contacts GB3 connected to TB13 terminals are GNO, GC, and GNC. A normally open contact connects to terminals GNO and GC and a normally closed contact connects to terminals GC and GNC.

NORMAL AND EMERGENCY LAMPS

The green normal and red emergency lamps indicate which source is supplying power to the load. During normal operation, the line supplies power from line A (L1) (drawing 626D0149), TB14-L1, TB7-11 (drawing 626C0164) to transformer T11 primary, back through TB7-10 (drawing 626D0149), TB14-7, K8 contacts, TB14-4, J1-W which connects to P1-W (drawing 626C0071). The circuit is completed through contacts K3 (5-6), back through P1-Y, J1-Y (drawing 626D0149), TB14-L2, to line B (L2). Transformer T11-X1 and -X2 supply approximately 40 volts to light green normal lamp DS11.

When the standby generator supplies power to the load, it energizes transformer T12 from generator line B (LL2) (drawing 626D0149), TB14-LL2, TB14-II, closed K8 contacts, TB14-5, TB7-12 (drawing 626C0164), through T12 primary, back through TB7-8 (drawing 626D0149), TB6-8 (drawing 626C0071), contacts K3 (1-3), relay bypass terminals K13-5 and -L3, contacts K4 (3-4), TB6-6 (drawing 626D0149), TB14-LL1, to generator line A (LL1). The secondary of T12 (drawing 626C0164) lights red emergency lamp DS12. Both lamps are 56-volt lamps operating on 40 volts.

EXERCISER CLOCK

The exerciser clock starts and stops the generator set automatically for periodic test and exercise operations without load. The exerciser clock is connected to lines A (L1) and B (L2) through the disconnect plug terminals X and Y. See drawing 626C0075. With 480- and 600-volt system, the exerciser is connected to a stepdown transformer.

Cam-operated switch contacts M1 (3-5) connect battery positive (B+) to the remote start terminal (RMT). The M1 contacts are shown in the normal position. After the operator selects the desired exercise periods, the exerciser clock automatically exercises the generator set.

START TIME DELAY

The motor timer operates on AC voltage and delays starting of the generator set if a power outage occurs. It is adjustable from 1 through 300 seconds. See drawing 626C0075. On 480- and 600-volt systems, a stepdown transformer (to 120 volts) is used to operate the time delay.

During a power outage, power from P1-X and P1-Y disappears. Upon de-energization, K7 begins its time delay. After the time delay, K7 contacts (1-5) close to connect battery voltage (B+) to the remote start terminal (RMT). The generator set starts and runs.

TRANSFER TIME DELAY

The motor timer operates on generator AC voltage whenever the generator set starts. It delays transfer of the load to the generator for an adjustable time period of 1 through 300 seconds.

Once the generator set is running, a circuit is completed from generator line A (LL1) (drawing 626D0149), TB14-LL1, TB6-6 (drawing 626C0075), TB6-11, TB6-12, relay K4, resistor R4, TB6-7 (drawing 626D0149), TB14-LL2, to generator line B (LL2). Relay K4 is energized (drawing 626C0075) and closes contacts K4 (3-4).

A circuit is now complete from TB6-6, through contacts K4 (3-4), transfer time delay K13, TB6-7 (drawing 626D0149), TB14-LL2, to generator line B (LL2). Transfer time delay K13 is energized and starts its time delay cycle. After the time delay, contacts K13 (1-5) close completing a circuit through normally-closed K3 contacts (1-3), TB6-8 (drawing 626D0149), TB14-9, closed K8 contacts, TB14-8, switch S8, TB14-6, and bring generator AC output voltage to the transfer switch motors. Transfer switch motors M and G operate to transfer the load to the standby generator set.

RETRANSFER TIME DELAY

This motor timer operates on normal line AC voltage and delays transfer of the load from the generator set to the normal line after a power outage. It is adjustable from 2 through 60 minutes.

After normal power returns, a circuit is complete from normal line A (L1) (drawing 626D0149), TB14-L1, terminal J1-X, P1-X (drawing 626C0075), retransfer time delay K10, contacts K10 (TDO), contacts K6 (3-5), TB1-4, TB1-5, switch S1, terminal P1-Y, J1-Y (drawing 626D0149), TB14-L2, to normal line B (L2). Retransfer time delay K10 is energized and starts its time delay.

After the adjustable time delay is expired, retransfer time delay K10 closes contacts K10 (TDC) (drawing 626C0075) and completes a circuit to relay K3. Relay K3 is energized and starts transfer of the load to the normal line. See *Restoration of Normal Line.*

STOP TIME DELAY

Stop time delay K9 (drawing 626C0075), adjustable from 2 through 60 minutes, starts the delay on energization (when normal power returns) for stopping the generator set. A circuit is completed from normal line A (L1) (drawing 626D0149), TB14-L1, terminal J1-X, P1-X (drawing 626C0075), through stopping time delay K9, contacts K9 (TDO), contacts K10 (TDC), K6 (3-5), TB1-4, TB1-5, switch S1, terminal P1-Y, J1-Y (drawing 626D0149), TB14-L2, to normal line B (L2).

After the stop time delay expires, stop time delay K9 closes contacts K9 (TDC) (drawing 626C0075) completing a circuit from line A (L1), (drawing 626D0149), TB14-L1, terminal J1-X, P1-X (drawing 626C0075), relay K7, contacts K9 (TDC), K10 (TDC), K6 (3-5), TB1-4, TB1-5, switch S1, terminal P1-Y, J1-Y (drawing 626D0149), TB14-L2, to normal line B (L2). Start time delay is energized and opens contacts K7 (1-5) to remove battery voltage (B+) from the remote terminal (RMT) and stop the generator set.

AT'S WITH CONTROL PANEL GROUPS 11 THROUGH 15

NORMAL OPERATION

Under normal conditions, the commercial line supplies power to the load through the closed K1 contacts lines A, B, and C shown in schematic diagram 626D0149. Two AC motors, one on line side (M) and one on generator side (G), operate the transfer switch. Relay K8 is energized whenever there is commercial line power from normal line A, which connects to terminal TB14-L1, through relay K8, to terminal TB14-4, terminal J1-W of receptacle J1. Terminal J1-W connects to terminal W of disconnect plug P1 (drawing 626D0138), which connects to normally closed K4 contacts (3-9) and back to Y terminal of receptacle J1 (drawing 626D0149). J1-Y connects to terminal TB14-L2 which connects to line B (L2) of transfer switch K1. Once the mechanically-held transfer switch is picked up by the normal line, it is mechanically held in that position.

It is the contacts closing and opening of relay K8 which allows one power source or the other to operate the transfer switch motors (see *Power Outage* and *Restoration of Normal Line*).

Battery Charging

The transfer switch line side K1 terminals A (L1) and B (L2) feed terminals TB14-L1 and TB14-L2, J1 receptacle terminals X and Y (drawing 626D0149) and P1 plug terminals X and Y (drawing 626D0138) to energize transformer T1 through fuse F1. Transformer T1 has three secondary terminals X1, X2, and X3. Terminals X1 and X2 supply approximately 20 volts output for 12-volt battery charging. Terminals X1 and X3 supply approximately 40 volts output for 24-volt battery charging.

For 12-volt battery charging, transformer terminal T1-X2 connects to resistor R1-2. Resistor terminal R1-1 connects to terminal 21 of battery charger plug-in module 6. Transformer terminal T1-X1 connects to terminal 15 of battery charger plug-in module 6. The battery charger module rectifies and regulates the DC output voltage to float-charge the cranking battery.

Positive output terminal 1 on module 6 supplies charging current through TB6-2 (drawing 626D0149), TB7-2 (drawing 626C0109) through the ammeter M11, TB7-1 (drawing 626D0149), TB6-1 (drawing 626D0138) to the B+ terminal on TB1 which connects to the positive terminal of the battery. Terminal 4 of plug-in module 6 connects to the ground terminal which in turn connects to the negative terminal of the battery. This battery charging module 6 has a rated output of 2 amperes maximum and is voltage regulated to float the battery continuously without damage to the battery.

POWER OUTAGE

When a power outage occurs (normal line), primary voltage to transformer T2 supplied from lines A (L1) and B (L2) (drawing 626D0149), through terminals X and Y of the disconnect plug, disappears. Voltage at terminals T2-X1 and T2-X2 goes to zero (drawing 626D0138). With zero input voltage to voltage sensor module 1, contacts (8-10) open to de-energize interposing line relay K3.

Relay contacts K3 (2-8) close, K3 (1-7) close, and K3 (6-9) open. Contacts K3 (1-7) close the circuit to terminal 9 of start-stop time delay module 7. After an adjustable time delay, module 7 closes the circuit between terminals 12 and 22 to apply battery voltage to the remote terminal (RMT).

The battery positive on the remote terminal (RMT) signals the generator set to start.

The AC running time meter is energized whenever the generator set operates. Generator line A (LL1) (drawing 626D0149) supplies power through TB14-LL1, TB6-6, TB7-6 (drawing 626C0164), to running time meter M12-1. Generator line C (LL3) (drawing 626D0149) supplies power through TB7-9 (drawing 626C0164) to M12-2.

Generator output voltage to transfer switch K2 (drawing 626D0149) lines A (LL1) and B (LL2), terminals TB14-LL1 and -LL2, TB6-6 and -7 (drawing 626D0138) energizes the primary of stepdown transformer T3.

Transformer T3 terminals X1 and X2 feed a nominal 40 volts into voltage sensor module 4 terminals 12 and 15. When this output voltage exceeds the set point of the module 4, the solid state switch (8-10) closes the circuit through module 8 (12-22), module 5 (16-18) to the battery positive line to energize generator interposing relay K4. The circuit from generator line A (LL1) is completed from terminal TB14-LL1 (drawing 626D0149), TB6-6, contacts K4 (7-4), contacts K3 (8-2) (drawing 626D0138), TB6-8 (drawing 626D0149), TB14-9, closed K8 contacts (relay K8 de-energized when commercial power disappears), TB14-8, switch S8, TB14-6, line-side transfer switch motor M, closed contacts MCO_o and GB2, TB14-5, closed K8 contacts, TB14-11, TB14-LL2, to generator line B (LL2). Transfer switch motor M operates and opens the line-side K1 contacts.

When transfer switch motor M operates, contacts MB1 and MB2 close. A circuit is completed from

TB14-6 (from generator line A, same as for switch motor M) through transfer switch motor G, contacts GCOc and MB2, TB14-5, K8 contacts, TB14-11, TB14-LL2 to generator line B (LL2). Motor G operates, closes the K2 contacts, and connects the load to the generator set.

Momentary Power Outage

A very short duration power outage or dip on normal line voltage can drop relay K3 (drawing 626D0138). Contacts K3 (1-7) close to signal the start-stop time delay module 7 to start timing. However, if the voltage dip or power outage is shorter than the time delay and the start-up time of the generator set, normally closed contacts K4 (2-8) will bypass any time delay in retransfer to re-energize relay K3 through the voltage sensors to keep the load on the normal line. Contacts K3 (1-7) open to reset the start-stop time delay.

AREA PROTECTION

Onan automatic transfer switches have provisions for connecting area protection equipment. The normallly closed output terminal of the area protection equipment connects to TB1-4 and -5 (see drawing 626D0138). A jumper between TB1-4 and -5 must be removed during wiring connections before the protection equipment will operate the circuit.

The area protection equipment opens the circuit between TB1-4 and -5 which removes the AC input voltage from voltage sensor module 1 (12-15). Module 1 opens the circuit through contacts (8-10) to drop line interposing relay K3.

Relay contacts K3 (1-7) close to energize start-stop time delay module 7. After the time delay period, module 7 contacts (12-22) close to connect B+ to the remote line (RMT) which signals the generator set to start.

Relay contacts K3 (6-9) open, K3 (2-8) close to prepare the transfer of the load from the line to the generator set. The generator voltage sensor module 4 contacts (8-10) close to energize relay K4. Contacts K4 (4-7) energize the transfer switch motors by completing the circuit from generator line A (LL1) (drawing 626D0149) through TB14-LL1, TB6-6 (drawing 626D0138), K4 (4-7), K3 (2-8), TB6-8 (drawing 626D0149), TB14-9, closed K8 contacts, TB14-8, switch S8, TB14-6, line-side transfer switch motor M, closed contacts MCOo and GB2, TB14-5, closed K8 contacts, TB14-11, TB14-LL2 to generator line B (LL2). Transfer switch motor M operates and opens the line-side K1 contacts.

When transfer switch motor M operates, contacts MB1 and MB2 close. This completes the circuit (from generator line A, same as for switch motor M) through transfer switch motor G, contact GCOc, closed contacts MB2, TB14-5, K8 contacts, TB14-11, TB14-LL2 to generator line B (LL2). Motor G operates, closes the K2 contacts, and connects the load to the generator set.

When the area proteciton equipment closes the circuit between TB1-4 and -5 (drawing 626D0138), the voltage sensor module 1 closes a circuit through terminals 8 and 10 to pick up line interposing relay K3 again as described in *Restoration of Normal Line.*

RESTORATION OF NORMAL LINE

When the normal line power returns, it energizes stepdown transformer T2 (drawing 626D0138). Transformer T2 output voltage terminals X1 and X2 feed voltage sensor module 1 terminals 12 and 15 through area protection terminals TB1-4 and -5. When the line voltage reaches normal, module 1 contacts (8-10) close to energize relay K3 through transfer bypass plug module 8 (1-6), module 5 (8-4), and switch contacts S1 (3-2). Normally closed contacts K3 (1-7) open to remove battery positive from start-stop time delay module 7 which initiates the time delay in stop. Also, contacts K3 (6-9) close the circuit from plug P1 terminal W, receptacle J1-W (drawing 626D0149), TB14-4, to relay K8, through TB14-L1 to terminal A (L1) on line side. Power from terminal B (L2) on line side from TB14-4 now completes a circuit to closed K8 contacts. TB14-7, closed contactsMB1 and GCOo, through switch motor G (generator side), to TB14-6, motor disconnect switch S8, TB14-8, closed K8 contacts, TB14-L1 to line A (L1). Transfer switch motor G operates, opens the K2 contacts, removing the load from the generator set.

When transfer switch motor G operates, contacts GB1 and GB2 close. A circuit is completed from TB14-7 (from line B, same as for switch motor G), through closed contacts GB1 and MCOc, line-side transfer switch motor M, TB14-6, switch S8, TB14-8, closed K8 contacts, TB14-L1, to line A (L1). Motor M operates, closes K1 contacts, and connects the load to the normal line.

The generator set continues to run until the start-stop time delay 7 (drawing 626D0138) times out to open the circuit to module 7 contacts (12-22) to remove B+ from the remote (RMT) line.

SIMULATION OF POWER OUTAGE

To ensure that the equipment is ready to perform if an actual power outage occurs, the operator should periodically simulate a power outage to keep the fuel system filled and battery charged, The Onan automatic transfer switch has two switches to provide a choice of testing or exercising the generator set with load or without load.

Without Load

To test the generator set without load, place selector switch S2 in the "WITHOUT LOAD" (closed) position (drawing 626D0138). Then place the test transfer switch in the "TEST" position to complete the circuit from the battery positive terminal through S1 (1-2) and S2 (2-3) to the remote (RMT) line. This signals the generator set to start and run unloaded as long as the

switch is in the "TEST" position. To stop the generator set, return the test switch to the "NORMAL" position.

With Load

To test the generator set under actual operating conditions, set selector switch S2 to the "WITH LOAD" position, then move the test transfer switch S1 from "NORMAL" position to "TEST" position. Relay contacts K3 (1-7) close to energize the start-stop time delay module 7. At the end of the time delay period, module 7 contacts (12-22) close to energize the remote terminal (RMT).

As the generator set comes up to speed, stepdown transformer T3 energizes undervoltage sensor module 4 to close the circuit through contacts (8-10), and generator interposing relay K4 picks up. Both contacts K3 (6-9) and K4 (3-9) are now open to break the circuit from terminal W of plug P1, to terminal W of receptacle J1 (drawing 626D0149), TB14-4 to de-energize relay K8.

Contacts K4 (4-7) also close (drawing 626D0138) completing the circuit through K3 (2-8), TB6-8 (drawing 626D0149), TB14-9, normally closed K8 contacts, TB14-8, switch S8, TB14-6, line-side transfer switch motor M, closed contacts MCOo and GB2, TB14-5, closed K8 contacts, TB14-11, TB14-LL2 to generator line B (LL2). Transfer switch motor M operates and opens the line-side K1 contacts.

When transfer switch motor M operates, contacts MB1 and MB2 close. A circuit is completed from TB14-6 (from generator line A, same as for switch motor M) through transfer switch motor G, contacts GCOc and MB2, TB14-5, K8 contacts, TB14-11, TB14-LL2 to generator line B (LL2). Transfer switch motor G operates, closes the K2 contacts, and connects the load to the generator set.

To end the test and retransfer the load back to the normal line, move the test switch S1 to "NORMAL" (drawing 626D0138). Relay K3 picks up through voltage sensor module 1 or modules 1, 2, and 3. Contacts K3 (1-7) open to de-energize start-stop delay module 7 which initiates stopping of the generator set. Contacts K3 (6-9) close completing a circuit through terminals W and Y of plug P1, W and Y of receptacle J1 (drawing 626D0149). Terminal J1-Y connects to TB14-L2 and to line B (L2); terminal J1-W connects to TB14-4, to relay K8, TB14-L1, and to line A (L1).

Relay K8 is energized and completes a circuit from line A (L1) through TB14-L1, closed K8 contacts, TB14-8, switch S8, TB14-6, generator side transfer switch motor G, closed contacts GCOo and MB1, TB14-7, closed K8 contacts, TB14-4, terminal J1-W, terminal P1-W (drawing 626D0138), K3 (6-9), terminal P1-Y, terminal J1-Y (drawing 626D0149), TB14-L2 to line B (L2). Motor G operates, opens the K2 contacts, and removes the load from the generator set.

When transfer switch motor G operates, contacts GB1 and GB2 close. A circuit is completed from TB14-6 (from line A, same as for switch motor G) through line-side transfer switch motor M, closed contacts MCOc and GB1, TB14-7, closed K8 contacts, TB14-4, terminal J1-W, terminal P1-W (drawing 626D0138), K3 (6-9), terminal P1-Y, terminal J1-Y (drawing 626D0149), TB14-L2, to line B (L2). Transfer switch motor M operates, closes the K1 contacts, and connects the load to the normal line. Start-stop time delay module 7 (drawing 626D0138) contacts (12-22) open after the time delay signaling the generator set to stop.

AUXILIARY CONTACTS

Small switches, mounted on line and generator side of the transfer switch, provide dry contacts to indicate transfer switch position. Drawing 626D0149 shows the K1 auxiliary contacts MB3 connected to TB13 terminals MNO, MC, and MNC. The normally open contact connects to terminals MNO and MC, the normally closed contact connects to terminals MC and MNC.

The K2 auxiliary contacts GB3 connected to TB13 terminals are GNO, GC, and GNC. A normally open contact connects to terminals GNO and GC and a normally closed contact connects to terminals GC and GNC.

EXERCISER CLOCK

The exerciser clock starts and stops the generator set automatically for periodic test operations. Drawing 626D0145 shows the exerciser clock M1 motor circuit connected to stepdown transformer T1 terminals X4 and X5. Transformer T1 primary connects to the line side of the transfer switch through disconnect plug terminals X and Y.

The exerciser clock cam-operated switch contacts M1-3, -4 and -5 connect to test transfer switch S1 and selector switch S2. The M1 switch contacts are shown in the normal position with the contacts (3-5) open and contacts (4-5) closed. After the operator selects the mode, the exerciser clock automatically exercises the generator set.

Exercise Without Load

With switch S2 in the "WITHOUT LOAD" position, the exerciser clock closes contact M1 (3-5) to complete the circuit from B+ through switch contacts S1 (2-3), M1 (3-5), S2 (2-3) to the remote (RMT) terminal. The generator set starts and runs as previously described under *Test Without Load* until the exerciser clock contacts M1 (3-5) open at the end of the exercise period.

Exercise With Load

With selector switch S2 in the "WITH LOAD" position, exerciser clock contacts M1 (4-5) open the circuit to remove battery positive from interposing line relay K3. Relay K3 drops out the same as it does if there is a power outage and the generator set starts and runs as long as the exerciser clock contact remains open.

MOTOR TIMER RETRANSFER TIME DELAY

The motor timer operates on AC voltage and delays retransfer of the load from the generator set to the line. A stepdown transformer T1 supplies 120 volts AC to the motor timer in all automatic transfer switches (see drawing 626D0145).

When the normal line voltage fails, the voltage sensors drop out relay K3 and timer relay K5. The voltage sensors sense restoration of normal line voltage and close the circuit from ground to relays K3 and K5. Relay contacts K5 (5-8) close to apply AC from T1-X4 and -X5 to the motor timer A11 (2-7). At the end of the time delay period, contacts A11 (6-8) close the circuit to pick up relay K3. Relay contacts K3 (2-8) open and contacts K3 (9-6) close to transfer the load from the generator set to the normal line.

PUSH TO RETRANSFER AND SELECTOR SWITCHES

Some automatic transfer switch installations require that the generator set continue to supply power until a retransfer signal is manually initiated after restoration of normal power. Some installations also require a selector switch for choice of automatic retransfer or manually initiated retransfer through a push-to-retransfer switch. Drawing 626D0145 shows both the selector switch S3 and push-to-retransfer switch S4.

Manual Retransfer

With S3 selector switch in "MANUAL" position, relays K3 and K5 drop out on a voltage dip or a commercial power outage. If the normal line restores voltage before the generator set can build up voltage, normally closed contacts K4 (2-8) will re-energize relay K3 to keep the load on the line.

If normal line power stays off, the voltage sensor module 4 energizes relay K4 through bypass module 8 contacts (12-22). Relay contacts K4 (2-8) open and contacts K5 (4-7) remain open to prevent K3 from picking up when the undervoltage sensor modules 1, 2 and 3 close the circuit on normal power restoration.

To initiate a retransfer when line power returns, the operator must push retransfer switch S4 bypassing contacts K5 (6-9) to energize relay K5 through the voltage sensors. Contacts K5 (6-9) close to "seal in" relay K5, and contacts K5-4 and -7 close to energize relay K3 through automatic-manual switch contacts S3 (2-3) and voltage sensor modules 1, 2 and 3. Relay contacts K3 (2-8) open and contacts K3 (6-9) close to transfer the load from the generator set to the normal line. See *Restoration of Normal Line.* Contacts K3 (1-7) open to initiate the time delay in stop.

Automatic Position

With automatic-manual transfer selector switch S3 in the "AUTOMATIC" position, relay K5 will pick up on normal power restoration through switch contacts S3 (1-2), and voltage sensor modules 1, 2 and 3. Relay contacts K5 (5-8) close the circuit from terminals X4 and X5 of stepdown transformer T1 to the motor circuit A11 (2-7). The motor timer times out and closes contacts A11 (6-8) to energize relay K3 through contacts S3 (1-2), A11 (6-8), and voltage sensor modules 1, 2 and 3. Relay K3 picks up to open K3 (2-8) and close K3 (6-9) to transfer the load from the generator set to the normal line. See *Restoration of Normal Line.* K3 (1-7) open to initiate the time delay stop.

NORMAL AND EMERGENCY LAMPS

The green normal and red emergency lamps indicate which source is supplying power to the load. During normal operation, the line supplies power from line A (L1) (drawing 626D0149), TB14-L1, TB7-11 (drawing 626C0164) to transformer T11 primary, back through TB7-10 (drawing 626D0149), TB14-7, K8 contacts, TB14-4, J1-W which connects to P1-W (drawing 626D0138). The circuit is completed through either contacts K3 (6-9) or K4 (3-9), back through P1-Y, J1-Y (drawing 626D0149), TB14-L2, to line B (L2). Transformer T11-X1 and -X2 supply approximately 40 volts to light green normal lamp DS11.

When the standby generator set supplies power to the load, it energizes transformer T12 from generator-side line A (LL1) (drawing 626D0138), contacts K4 (4-7), K3 (2-8), TB6-8 (drawing 626D0149), TB14-9, TB7-8 (drawing 626C0164), through T12 primary, back through TB712 (drawing 626D0149), TB14-5, closed K8 contacts, TB14-11, TB14-LL2, to generator line B (LL2). The secondary of T12 (drawing 626C0164) lights red emergency lamp DS12. Both lamps are 56-volt lamps operating on 40 volts.

TIME DELAY TRANSFER

The transfer time delay module 8 plugs into position 8 of the control accessory panel. The transfer time delay module delays the load pickup for an adjustable 0.5 to 10 seconds after the generator set starts.

When the generator set starts, generator line A (LL1) (drawing 626D0149) completes a circuit from TB14-LL1, through T6-6 (drawing 626D0138), transformer T3 primary, back through TB6-7 (drawing 626D0149), TB14-11, TB14-LL2, to generator line B (LL2). The secondary of transformer T3 (drawing 626D0138) supplies a nominal 40 volts to voltage sensor module 4 (12-15). Module 4 contacts (8-10) close the circuit through interposing generator relay K4 coil to terminal 12 of transfer time delay module 8. Battery positive voltage feeds through terminals 18 and 16 of the voltage regulator module 5 to module 8 terminal 22. Module 8 delays closing of solid state switch A8 (12-22) to energize relay K4. Relay contacts K4 (4-7) close the circuit through relay contacts K3 (2-8), TB6-8 (drawing 626D0149), to TB14-9, closed K8 contacts, TB14-8, switch S8, TB14-6, line-side transfer switch motor M, closed contacts MCOo and GB2, TB14-5, closed K8 contacts, TB14-11, TB14-LL2, to generator line B (LL2). Transfer switch motor M is energized, will open the K1 contacts, and remove the load from the normal line. Motor G then operates to connect the load to the generator set.

BATTERY VOLTAGE SENSOR

The battery voltage sensor, available in 12-volt or 24-volt versions, is a plug-in module with two relays mounted on the printed circuit board. The battery voltage sensor module 10 monitors the battery charging system. If the battery charger is exceeding a safe float voltage, it lights the high battery voltage lamp DS14. If the battery float charger fails to charge, the sensor lights the battery low voltage lamp DS13.

Drawing 626D0145 shows the ground lead connecting to module 10 terminal 12. The battery positive line connects to module 10 terminal 19. If the battery charger is exceeding the high battery voltage sensor setting, the sensor lights the high battery voltage lamp DS14 through a circuit from module 10 contact 21, TB6-3 (626D0149), TB7-3 (626C0164), DS14, TB7-5 (drawing 626D0149), TB6-5 to ground. Contacts connected to TB2 terminals 1 and 2 close (drawing 626D0145). Contacts connected to TB2 terminals 2 and 3 open. If the battery charger has failed to charge, the battery voltage will drop below the battery voltage sensor setting and it lights the low battery voltage lamp DS13, through a circuit from module 10 contact 17, TB6-4 (drawing 626D0149), TB7-4 (drawing 626C0164), DS13, TB7-5 (drawing 626D0149), and TB6-5 to ground. The battery voltage sensor closes the contacts connected to TB2 terminals 4 and 5 (drawing 626D0145) and opens the contacts connected to TB2 terminals 5 and 6 to indicate a low battery voltage condition.

AC OVERVOLTAGE SENSOR

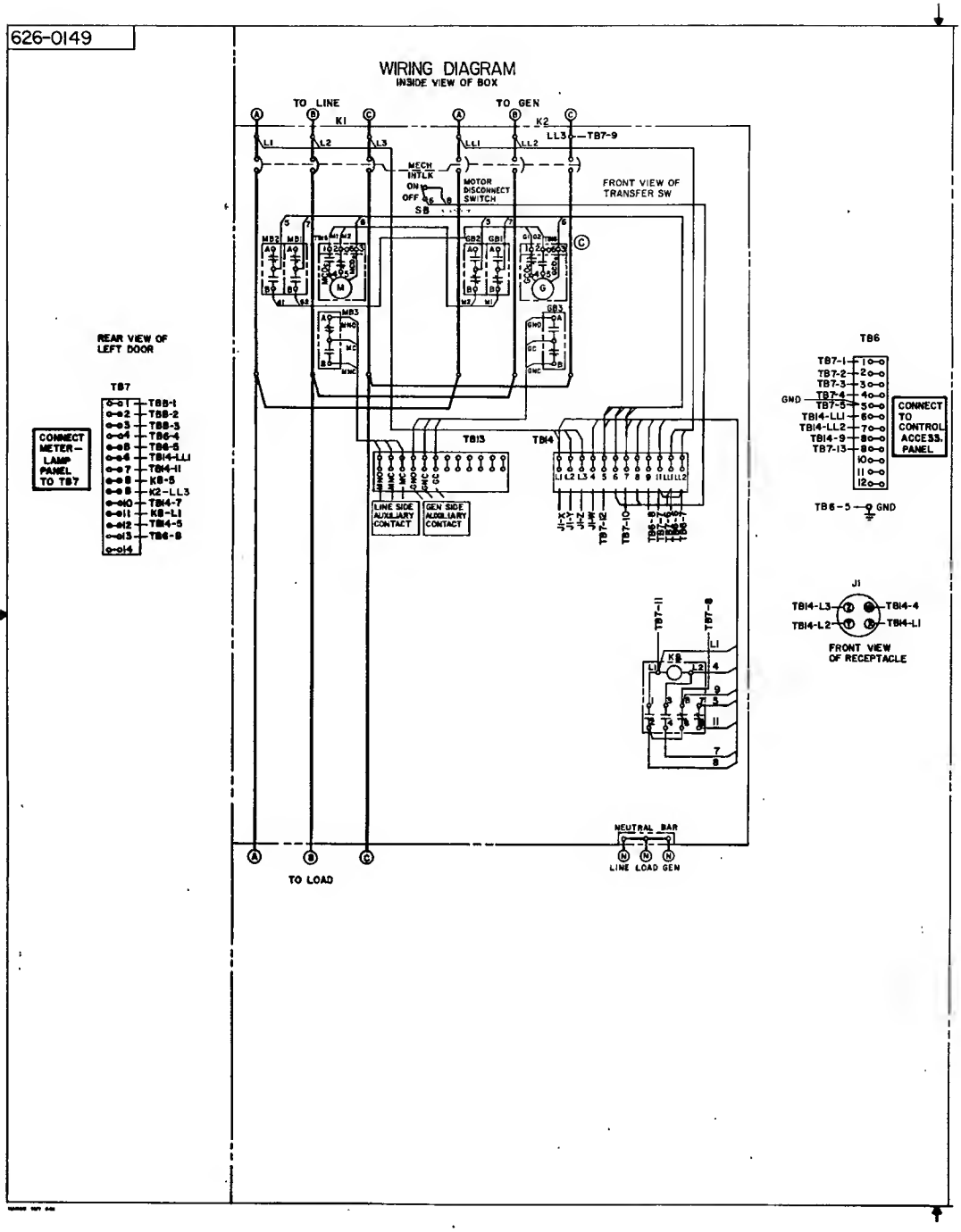
Overvoltage sensors monitor the commercial line and start the generator set in case the commercial line exceeds the set voltage. Drawing 626D0145 shows three voltage sensor modules 13, 14 and 15 monitoring a three-phase system. The solid state switches of all three voltage sensors connect in parallel so that if any one line voltage exceeds the voltage setting, the voltage sensor will close its circuit between terminals (8-10) to energize overvoltage relay K6. Contacts K6 (1-7) open to drop relay K3.

When relay K3 is de-energized, contacts K3 (6-9) open. Because contacts K4 (3-9) open after the generator set starts, the circuit to terminal P1-W, J1-W (drawing 626D0149), TB14-4, and to relay K8 is opened. With relay K8 de-energized, generator output can operate the transfer switch motors through the normally closed K8 contacts.

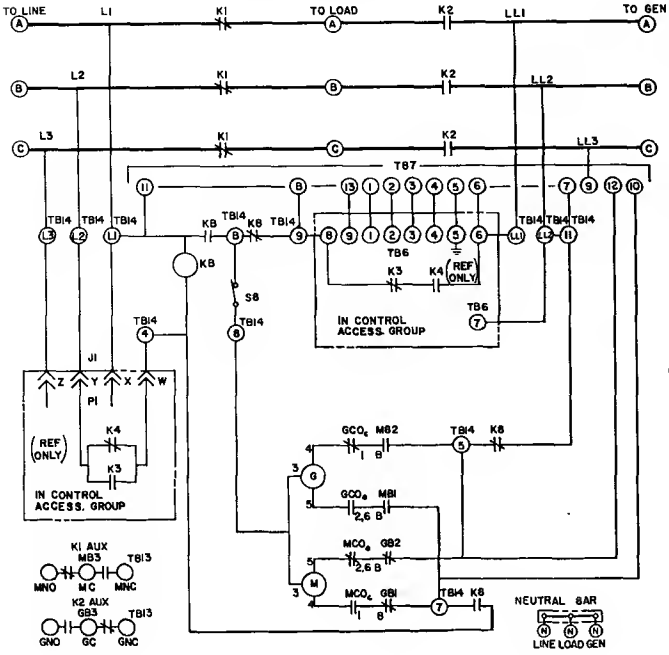
Contacts K3 (1-7) close (drawing 626C0145) to energize the start-stop time delay module 7. Module 7 contacts (12-22) close to energize the remote line (RMT) and start the generator set. When the generator set comes up to speed and voltage, relay K4 opens contacts K4 (3-9). This breaks the circuit through P1-W, J1-W (drawing 626D0149), TB14-4 to relay K8. Contacts K4 (4-7) (drawing 626D0145) close to energize the transfer switch through contacts K3 (2-8), TB6-8 (drawing 626D0149), TB14-9, closed K8 contacts, TB14-8, switch S8, TB14-6, through transfer switch motor M, closed contacts MCO$_O$ and GB2, TB14-5, closed K8 contacts, TB14-11, TB14-LL2, to generator line B (LL2) to transfer the load from the line to the generator set. See *Power Outage.*

When the commercial line voltage returns to normal, the voltage sensor opens the circuit between terminals (8-10) to drop relay K6 (drawing 626D0145). Contacts K6 (1-7) close again to allow relay K3 to be energized through plug-in module 8 and the undervoltage sensors. See *Restoration of Normal Line.*

626-0149


WIRING DIAGRAM
INSIDE VIEW OF BOX
TO LINE
TO GEN
K1
K2
L1
L2
L3
LL1
LL2
LL3
TB7-9
MECH INTLK
ON
OFF
SB
MOTOR DISCONNECT SWITCH
FRONT VIEW OF TRANSFER SW
REAR VIEW OF LEFT DOOR
TB7
CONNECT METER-LAMP PANEL TO TB7
TB8-1
TB8-2
TB8-3
TB6-4
TB6-5
TB14-LL1
TB14-11
K8-5
K2-LL3
TB14-7
K8-L1
TB14-5
TB6-8
TB13
TB14
LINE SIDE AUXILIARY CONTACT
GEN SIDE AUXILIARY CONTACT
TB6
TB7-1
TB7-2
TB7-3
TB7-4
TB7-5
TB14-LL1
TB14-LL2
TB14-9
TB7-13
GND
CONNECT TO CONTROL ACCESS. PANEL
TB6-5 GND
J1
TB14-L3
TB14-L2
TB14-4
TB14-L1
FRONT VIEW OF RECEPTACLE
K8
NEUTRAL BAR
LINE LOAD GEN
TO LOAD

SCHEMATIC DIAGRAM



PARTS LIST

REF DES	PART NO	A/M	QTY	DESCRIPTION
J1	328-0696	B	1	HARNESS-DISC PLUG
	322-0900(REF)	A	1	RECEPTACLE
K1,K2	307-1217	D	1	TRANSFER SWITCH (800)
	307-1218	D	1	TRANSFER SWITCH (1200)
	307-1324	D	1	TRANSFER SWITCH (1750)
K8	307-1266(REF)	B	1	RELAY-INSTANT XFR TO LINE
S8	308-0069	P	1	SWITCH-MOTOR DISCONNECT
	301-3663	B	1	BRACKET-SW MTG
TB7	328-0895	D	1	HARNESS-CABINET
	333-1697(REF)	A	1	TERMINAL BLOCK
	332-1698	A	1	MARKER STRIP
	98-2799	A	1	LABEL-TERMINAL BLOCK
	98-2548	A	1	LABEL-WITHSTAND RATING (800)
	98-2617	A	1	LABEL-WITHSTAND RATING (1200)
	98-2709	A	1	LABEL-WITHSTAND RATING (1750)
	301-3975	B	1	CONT BOX & LOCK (800 & 1200)
	301-3658	B	2	BRACKET-TRANSFER SW (800 & 1200)
	301-3935	B	1	CONT BOX & LOCK (1750)
	301-3793	D	1	HOUSING-SWINGING PANEL
	301-3892	A	1	BAR-HARNESS SUPPORT
	405-0063	A	2	HINGE-PIN
	508-0177	P	2	WASHER-NYLON
	405-0070	A	1	PIN-LATCH
	300-1138	B	1	MOUNTING PKG-METER PNL
	99-1261	A	1	NAMEPLATE-CONTROL
	332-1674	-	2	CLAMP-LOOP
	332-1419	-	6	CLAMP-LOOP
	332-0050	-	1	CLAMP-LOOP
	332-1758	D	1	SHIELD-UPPER XFR SW (1750)
	337-1759	D	1	SHIELD-LOWER XFR SW (1750)
	332-1706	D	1	SHIELD-UPPER XFR SW (800 & 1200)
	332-1710	C	1	SHIELD-LOWER XFR SW (800 & 1200)
A	98-2708	C	2	LABEL-CAUTION
	516-0030	A	4	CLIP-SPEED FASTENER
	337-0051	-	1	CLIP-WIRE (7/16)

NOTES:

1. TRANSFER SWITCH MECHANICALLY HELD BOTH SIDES SHOWN LOCKED IN NORMAL LINE - GEN SIDE OPEN NORMAL LINE SHOWN DE-ENERGIZED
   M - - - - OPERATING MOTOR - NORMAL LINE
   MBI & 2 - INTERLOCK CONTACTS - NORMAL LINE
   MB3 - - - AUX SIGNAL CONTACTS - NORMAL LINE
   MCO$_N$ - - CUT OFF SWITCH - OPENS WHEN K1 CLOSES
   MCO$_E$ - - CUT OFF SWITCH - OPENS WHEN K1 OPENS
   G - - - - OPERATING MOTOR - GEN SIDE
   GBI & 2 - INTERLOCK CONTACTS - GEN SIDE
   GB3 - - - AUX SIGNAL CONTACTS - GEN SIDE
   GCO$_N$ - - CUT OFF SWITCH - OPENS WHEN K2 CLOSES
   GCO$_E$ - - CUT OFF SWITCH - OPENS WHEN K2 OPENS

2. MOTOR DISCONNECT SWITCH:
   FOR MANUAL OPERATION OF TRANSFER SWITCH, THROW SWITCH TO "OFF."
   CAUTION:
   RETURN TRANSFER SWITCH TO ORIGINAL POSITIONS BEFORE SWITCHING TO "ON." SWITCH MUST BE LEFT IN "ON" POSITION EXCEPT FOR MANUAL SWITCHING.

3. WHEN USED FOR 1PH, TERMINALS MARKED "C" (TO LINE, LOAD & GEN) ON TRANSFER SWITCH ARE NOT USED.

THIS INFORMATION IS FOR MANUFACTURERS USE ONLY		
AMPS	VOLTS	DASH NO.
800	208,240	-01
1200	208,240	-02
1750	208,240	-03

TRANSFER SWITCH CABINET ASSY: D
TRANSFER SW MECHANICALLY HELD BOTH SIDES WITH MANUAL OPERATOR
AUXILIARY CONTACTS LINE & GEN SIDE

REV	DESCRIPTION	BY	DATE
C	ADDED TERMINALS 4,5 & 6	MD	JV 2-17-75
B	UPDATED	CDR	JV 8-18-74
A	WAS 98-2078	CDR	JV 10-10-74

Onan — DIVISION OF ONAN CORPORATION, Minneapolis, Minnesota

DATE 7-17-74 | DR RDS | CH | APP'D CDR

SUPPL: AT CO, AT DD } 3PEC B

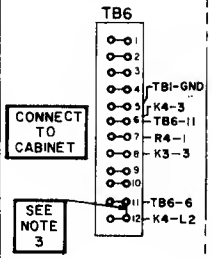
208,240 Vt 800, 1200, 1750 A; 1PH 3W OR 3PH 4W; 50/60 Hz

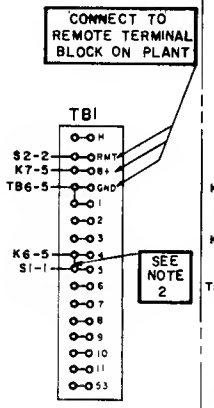
T TRANSFER SWITCH-CABINET ASSY (WIRING DIAGRAM)

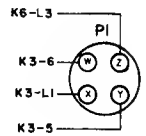
DWG NO. 626-0149 | REV D

626-0071

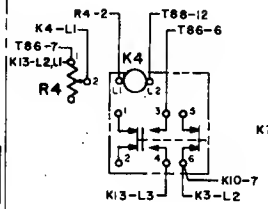
INSIDE VIEW OF TRANSFER SW CABINET OR SWINGING PNL HOUSING

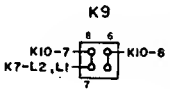


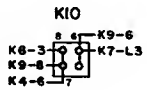


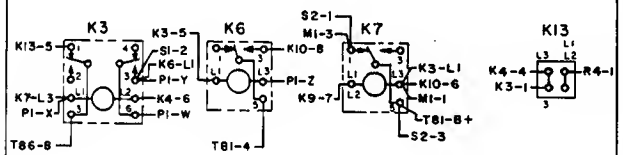


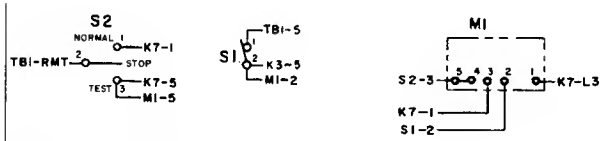
WIRING DIAGRAM
REAR VIEW OF SWINGING PANEL





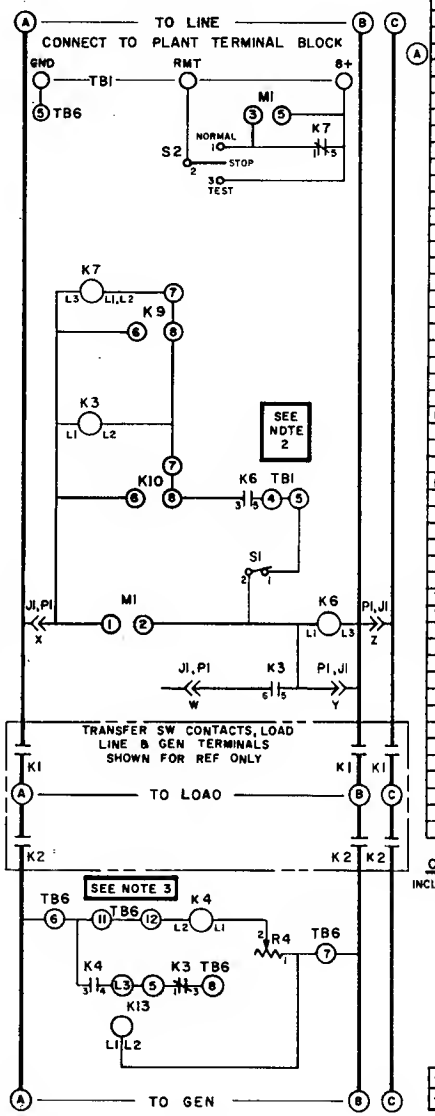






NOTES:
1. ALL COMPONENTS SHOWN IN DE-ENERGIZED POSITION, UNLESS OTHERWISE NOTED
2. TO ADD AREA PROTECTION EQUIPMENT, OR REMOTE TEST TRANSFER SWITCH, REMOVE JUMPER 8 CONNECT TO T81-4 & 5
3. TO ACTIVATE TRANSFER-INHIBIT CIRCUIT, REMOVE JUMPER 8 CONNECT TO TB6-11 & 12

SCHEMATIC



PARTS LIST					
REF. DES.	PART NO	SPEC SIZE	QTY	*BULK	DESCRIPTION
K3	307-1113	B	1		RELAY-INTERPOSING LINE (208V)
	307-1083	B	1		RELAY-INTERPOSING LINE (240V)
K4	307-0664	C	1		RELAY-INTERPOSING GEN
K6	307-1114	B	1		RELAY-PHASE PROTECTION (208V)
	307-1081	B	1		RELAY-PHASE PROTECTION (240V)
K7	307-1114	B	1		RELAY-START STOP (208V)
	307-1081	B	1		RELAY-START STOP (240V)
	301-3375	A	1		PLATE-RELAY MTG
K9,K10	301-3838	A	2		BYPASS ASSY-RELAY
K13	301-3840	A	1		BYPASS ASSY-RELAY
MI	332-1484	A	1		TERMINAL BLOCK ASSY
					(CLOCK BYPASS)
PI	323-0901	A	1		PLUG-LINE DISCONNECT
	301-3765	A	2		PLATE-PANEL INTERLOCK
	#503-0278	P	15"		HOSE
R4	304-0131	A	1		RESISTOR, 750Ω, 25W
SI	308-0089	P	1		SWITCH-TEST TRANSFER
S2	308-0138	A	1		SWITCH-SELECTOR
TBI	332-1899	A	1		MARKER STRIP
TB6	332-1469	A	1		MARKER STRIP
	301-3825	D	1		PANEL-SWINGING RELAY
	98-2795	D	1		SILKSCREEN-PANEL (FRONT)
	98-2796	D	1		SILKSCREEN-PANEL (REAR)
	405-1872	A	2		CLIP-DOOR
	526-0003	—	2		WASHER-FLAT
	818-0150	—	2		RIVET-ORIVE
	338-0923	E	1		WIRING HARNESS-MAIN
	301-2259	A	1		PLATE-COVER
	301-3842	A	1		PLATE-COVER

626-0071

CONTROL ACCESSORY GROUP 01
INCLUDES ALL STANDARD ITEMS

-01	240V
-02	208V

LET	REVISION	CKD	ENGR	DATE
A	K6 WAS 307-0114	WS	JV	2-14-75

Onan — DIVISION OF ONAN CORPORATION, Minneapolis, Minnesota

MODEL NO: AT C, AT O

208/240V, 3 PH, 4W, 50/60 Hz

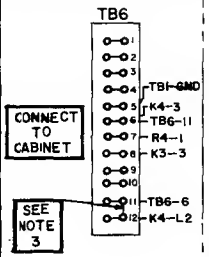
DATE 1-6-75 | BY ADB | ENGR JIM VINT | CKD CDR

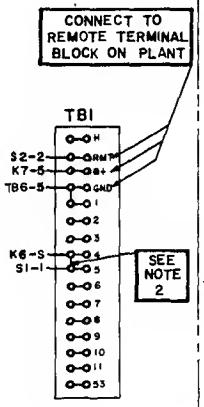
NAME: CONTROL ACCESS. PANEL (WIRING DIAGRAM)

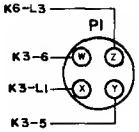
TEPIA FROM 626-0073 | DWG NO 626-0071 | DWG SIZE C

626-0075

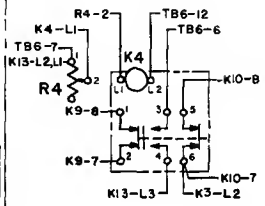
INSIOE VIEW OF TRANSFER SW CABINET OR SWINGING PNL HOUSING

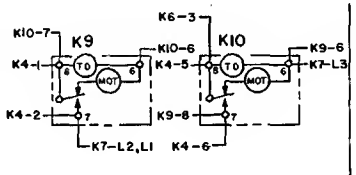


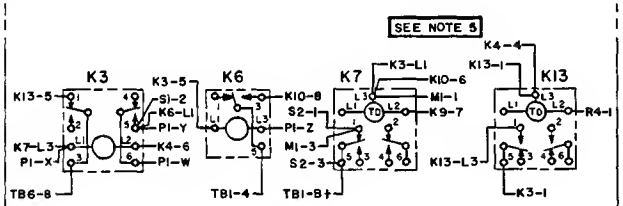


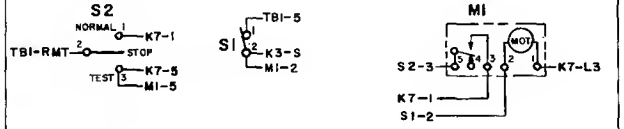


WIRING DIAGRAM
REAR VIEW OF SWINGING PANEL



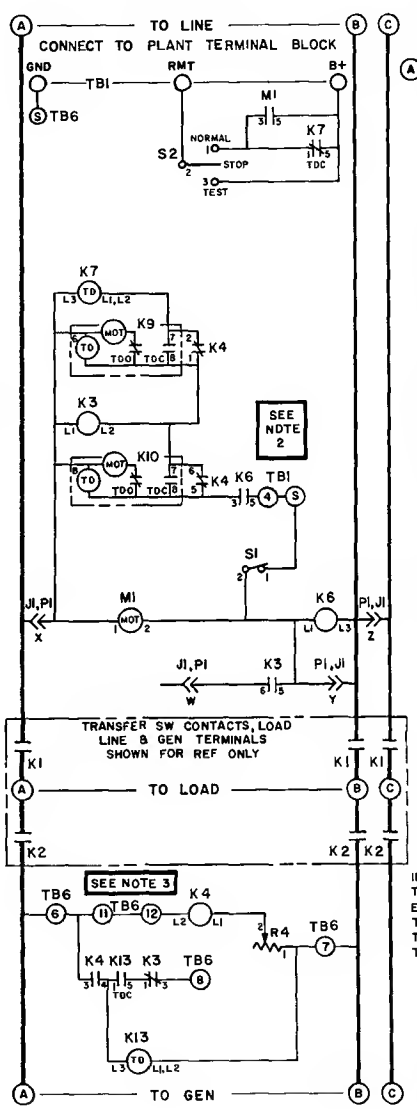






NOTES:
1. ALL COMPONENTS SHOWN IN DE-ENERGIZED POSITION, UNLESS OTHERWISE NOTED
2. TO ADD AREA PROTECTION EQUIPMENT, OR REMOTE TEST TRANSFER SWITCH, REMOVE JUMPER 8 CONNECT TO TBI-4 & 5
3. TO ACTIVATE TRANSFER-INHIBIT CIRCUIT, REMOVE JUMPER 8 CONNECT TO TB6-11 & 12
4. AFTER TEST, PLANT WILL RUN FOR DURATION OF TIME DELAYS
5. TO CONNECT RELAYS K7 & K13; FOR 208V; WIRE TO L2 & L3 FOR 240V; WIRE TO L1 & L3

SCHEMATIC



-01	60Hz	240V
-02	50Hz	240V
-03	60Hz	208V
-04	50Hz	208V

PARTS LIST

REF. DES.	PART NO	DWG SIZE	QTY	* BULK	DESCRIPTION
K3	3D7-1113	B	1		RELAY-INTERPOSING LINE (208V)
	307-1083	B	1		RELAY-INTERPOSING LINE (240V)
K4	307-0664	C	1		RELAY-INTERPOSING GEN
K6	3D7-1114	B	1		RELAY-PHASE PROTECTION (208V)
	307-1081	B	1		RELAY-PHASE PROTECTION (240V)
K7	307-1158	B	1		RELAY-TIME DELAY ON STARTING
					1 TO 300 SEC ON DE-ENERGIZATION
	301-331S	A	1		MOUNTING PKG-RELAY PNL
K9	307-0724	B	1		RELAY-TIME DELAY ON STOPPING
					AFTER RETRANSFER (60Hz)
	307-0723	B	1		RELAY-TIME DELAY ON STOPPING
					AFTER RETRANSFER (50Hz)
	336-2318	A	1		LEAD ASSY
	336-2319	A	1		LEAD ASSY
K10	307-0724	B	1		RELAY-TD ON RETRANSFER (60Hz)
	307-0723	B	1		RELAY-TD ON RETRANSFER (50Hz)
	336-2309	A	1		LEAD ASSY
K13	307-1144	B	1		RELAY-TIME DELAY ON TRANSFER
					1 TO 300 SEC ON ENERGIZATION
	301-331S	A	1		MOUNTING PKG-RELAY PNL
	336-2310	A	1		LEAD ASSY
MI	307-1103	B	1		CLOCK-PLANT EXERCISER (60Hz)
	307-1105	B	1		CLOCK-PLANT EXERCISER (50Hz)
PI	323-0901	A	1		PLUG-LINE DISCONNECT
	301-376S	A	2		PLATE-PANEL INTERLOCK
	*503-0276	P	15"		HOSE
R4	3D4-0131	A	1		RESISTOR, 750Ω, 25W
SI	308-0069	P	1		SWITCH-TEST TRANSFER
S2	308-0138	A	1		SWITCH-SELECTOR
TBI	332-1699	A	1		MARKER STRIP
TB6	332-1469	A	1		MARKER STRIP
	3DI-3825	D	1		PANEL-SWINGING RELAY
	98-2795	D	1		SILKSCREEN-PANEL (FRONT)
	98-2796	D	1		SILKSCREEN-PANEL (REAR)
	40S-1872	A	2		CLIP-DOOR
	S26-0003	—	2		WASHER-FLAT
	818-015D	—	2		RIVET-DRIVE
	338-0923	E	1		WIRING HARNESS-MAIN
	3DI-2259	A	1		PLATE-COVER
	3DI-3842	A	1		PLATE-COVER

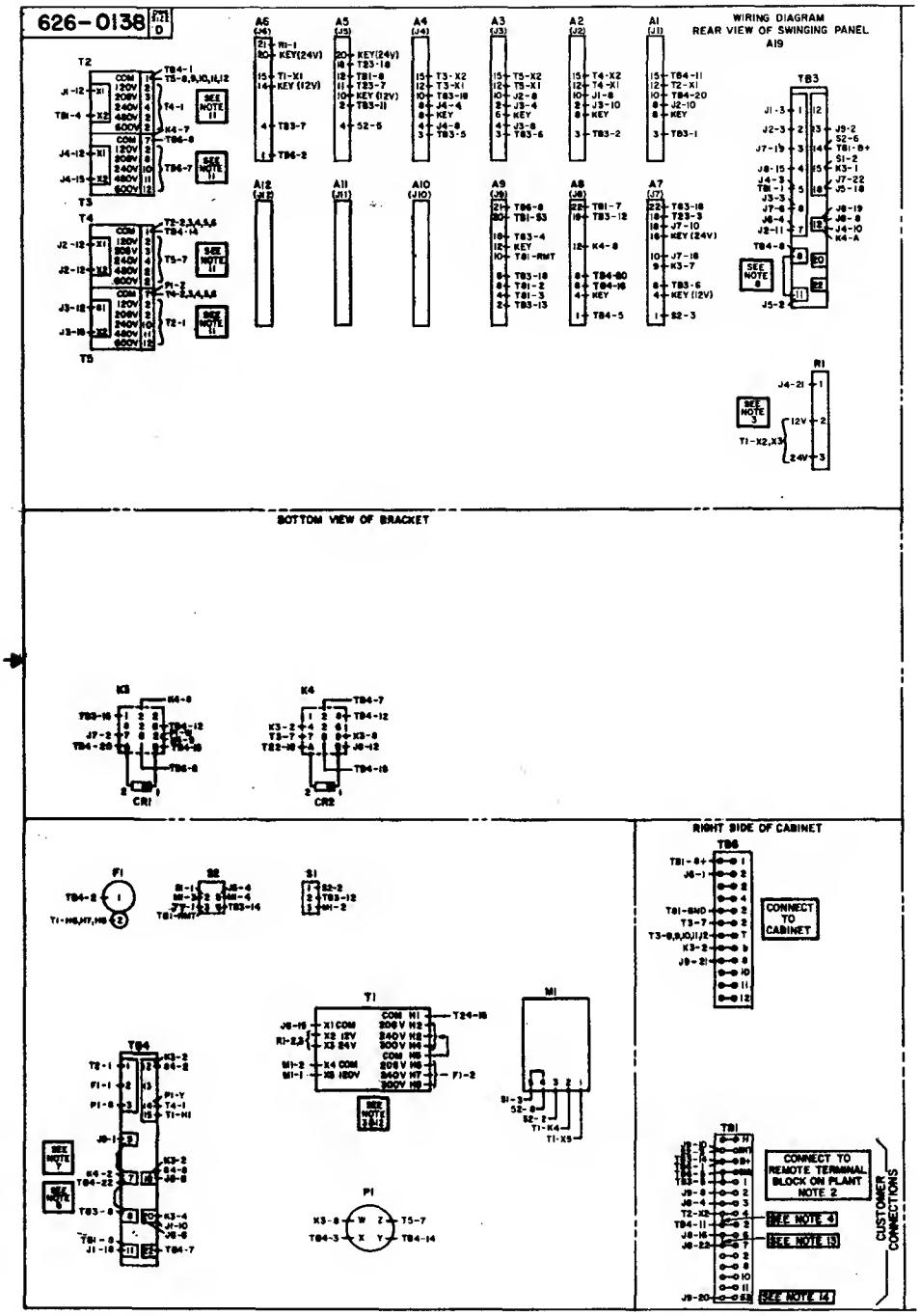
626-0075

CONTROL ACCESSORY GROUP 05
INCLUDES ALL STANDARD ITEMS, PLUS;
TD RETRANSFER 2-60 MIN
EXERCISER CLOCK
TD START 1-300 SEC
TO TRANSFER 1-300 SEC
TO STOP 2-60 MIN

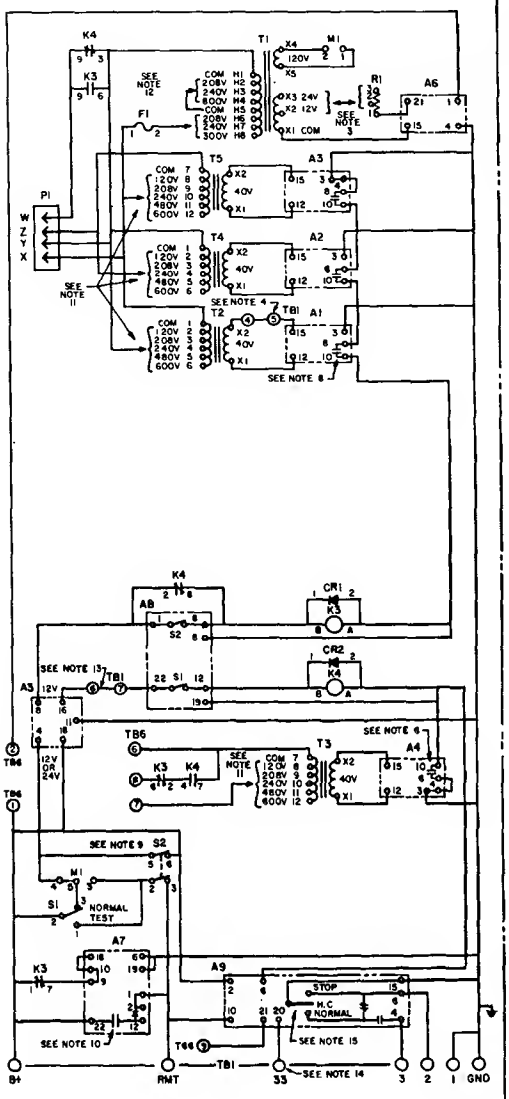
A	K6 WAS 307-1114	JV 2-14-75
LET	REVISION	CKR. ENGR. DATE

Onan — DIVISION OF ONAN CORPORATION, Minneapolis, Minnesota

MODEL NO	AT C AT D
	208/240V, 3 PH, 4W, 50/60 Hz
DATE	1-6-75
DR.	ADB
ENGR.	Tim Wing
CKR.	CDR
NAME	CONTROL ACCESS. PANEL (WIRING DIAGRAM)
SEPIA FROM	626-0175
DWG NO	626-0075
DWG SIZE	C


626-0138
WIRING DIAGRAM
REAR VIEW OF SWINGING PANEL
A19
BOTTOM VIEW OF BRACKET
RIGHT SIDE OF CABINET
CONNECT TO CABINET
CONNECT TO REMOTE TERMINAL BLOCK ON PLANT NOTE 2
CUSTOMER CONNECTIONS
SEE NOTE 4
SEE NOTE 13
SEE NOTE 14
CR1
CR2

SCHEMATIC DIAGRAM

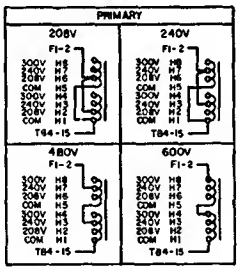


NOTES:

1. ALL COMPONENTS SHOWN IN DE-ENERGIZED POSITION UNLESS OTHERWISE NOTED
2. 2 WIRE START ON AT C & AT D CONNECT TO B+, GND & RMT
   3 WIRE START ON AT E CONNECT TO B+, 1, 2, & 3
3. FOR 12V BATTERY CONNECT WIRE MARKED T1-X2, X3 R1-2, 3 BETWEEN T1-X2 & R1-2 (AT D & E)
   FOR 24V BATTERY CONNECT WIRE MARKED T1-X2, X3 R1-2, 3 BETWEEN T1-X3 & R1-3 (AT C)
4. TO ADD AREA PROTECTION EQUIPMENT, OR REMOTE TEST TRANSFER SWITCH, REMOVE JUMPER BETWEEN TB1-4 & 5
5. TO ADD OVER-VOLTAGE SENSING, REMOVE JUMPER BETWEEN TB4-7 & 9
6. TO ADD OVER & UNDER FREQ SENSING, REMOVE JUMPER BETWEEN TB3-9 & 11
7. TO ADD PUSH TO RETRANSFER (MOTOR TIMER) REMOVE JUMPER BETWEEN TB4-5 & 7
8. THIS CONTACT SYMBOLIZES A SOLID STATE SWITCH THAT CLOSES WHEN VOLTAGE IS NORMAL (A1, A2, A3, & A4)
9. TEST OR EXERCISE (S2 SHOWN IN WITHOUT LOAD POSITION)
   9.1. WITH LOAD - PLANT STARTS AND TAKES OVER LOAD. PLANT RUNS FOR DURATION OF TEST OR EXERCISE PERIOD PLUS ANY TIME DELAYS
   9.2. WITHOUT LOAD - PLANT STARTS AND RUNS FOR DURATION OF TEST OR EXERCISE PERIOD
10. THIS CONTACT SYMBOLIZES A SOLID STATE SWITCH WHICH CLOSES AFTER 0.5 SEC TO 15 SEC DELAY AND OPENS AFTER A 0.5 MIN TO 5 MIN DELAY
11. WIRE TRANSFORMERS T2, 3, 4 & 5 AS FOLLOWS

FOR 208V CONNECT	T4-1 TO T2-3 T86-7 TO T3-9 T5-7 TO T4-3 T2-1 TO T5-9
FOR 240V CONNECT	T4-1 TO T2-4 T86-7 TO T3-10 T3-7 TO T4-4 T2-1 TO T3-10
FOR 480V CONNECT	T4-1 TO T2-5 T86-7 TO T3-11 T3-7 TO T4-5 T2-1 TO T3-11
FOR 600V CONNECT	T4-1 TO T2-6 T86-7 TO T3-12 T5-7 TO T4-6 T2-1 TO T5-12

12. WIRE T1 TRANSFORMER AS FOLLOWS:



13. TO ADD PARALLELING SWITCH BOARD TRANSFER INHIBIT CIRCUIT, REMOVE JUMPER TB1-8 & 7
14. OVERCRANK SIGNAL ON AT E ONLY. CONNECT TO TERMINAL 53 IN REMOTE ANNUNCIATOR
15. 2 TO 3 WIRE CONVERTER (USED ON AT E ONLY)
    THE SELECTOR SWITCH HAS THREE POSITIONS:
    STOP ----- SHUTS DOWN THE PLANT AND PREVENTS IT FROM STARTING. USE THIS POSITION WHEN SERVICING THE PLANT.
    NORMAL ---- ALLOWS THE PLANT TO START AND ASSUME THE LOAD IF A LINE FAILURE OCCURS.
    HAND CRANK - PREVENTS AUTOMATIC PLANT STARTING BUT ALLOWS STARTING AND STOPPING AT THE PLANT. USE THIS POSITION FOR PLANT MAINTENANCE.

CONTROL ACCESSORY GROUP - 11
BATTERY CHARGER MODULE
3 UNDER VOLTAGE SENSOR MODULES (LINE)
1 UNDER VOLTAGE SENSOR MODULE (GEN)
NORMAL - TEST SWITCH
WITH LOAD - WITHOUT LOAD SWITCH
2 TO 3 CONVERTER (AT E ONLY)

TO START - STOP

PARTS LIST

REF DES	PART NO	ATT	QTY	DESCRIPTION
A1,2,3	300-0780	C	3	UNDER VOLTAGE SENSOR (LINE)
A4	300-0780	C	1	UNDER VOLTAGE SENSOR (GEN)
A5	300-0847	B	1	MODULE - VOLTAGE 12V (AT D & E)
	300-0848	B	1	MODULE - 24V TO 12V CONVERTER (AT C)
A6	300-0793	C	1	BATTERY CHARGER - 2 AMP 12V (AT D & E)
	300-0794	C	1	BATTERY CHARGER - 2 AMP 24V (AT C)
A7	300-0921	C	1	TD START-STOP 12V (AT D & E)
	300-0922	C	1	TD START-STOP 24V (AT C)
				0.5 SEC TO 15 SEC DELAY ON START
				0.5 SEC TO 5 MIN DELAY ON STOP
A8	300-0927	B	1	BYPASS PLUG - TRANSFER
				SET S1 ON & 92 ON
A9	300-0937	B	1	MODULE - BLANK (SPARE) (AT C & D)
	300-0926	C	1	2 TO 3 WIRE CONVERTER (AT E)
A10	300-0937	B	1	MODULE - BLANK (SPARE)
A11,12	300-0937	B	2	MODULE - BLANK (SPARE)
A19	300-1134	C	1	PANEL ASSY - SWINGING
F1	321-0180REF)	P	1	FUSE - 1 AMP 600V
	321-0178REF)	P	1	FUSE - HOLDER
K3	307-1058	B	1	RELAY - INTERPOSING LINE 12V
K4	307-1058	B	1	RELAY - INTERPOSING GEN 12V
M1	332-1484	A	1	PLATE - CLOCK COVER
P1	323-0901REF)	A	1	PLUG - LINE DISCONNECT
R1	353-0044REF)	A	1	RESISTOR - 6 OHM 2.5 OHM TAP 75W
S1	308-0324REF)	P	1	SWITCH - TEST TRANSFER
S2	308-0323REF)	P	1	SWITCH - SELECTOR
T1	345-0379REF)	B	1	TRANSFORMER - BAT CHARGER
T2-5	345-0374REF)	C	2	TRANSFORMER ASSY - STEPDOWN
TB1	332-1699	A	1	MARKER STRIP
TB6	332-1469	A	1	MARKER STRIP
	338-0777REF)	E	1	HARNESS - MAIN
	332-1278	-	9	PLUG - KEYING
	301-3583	B	1	COVER - RACK
	332-0060	-	1	CLIP - WIRE

THIS INFORMATION IS FOR MANUFACTURERS USE ONLY	
MODEL	50/60Hz
AT C	-01
AT D	-02
AT E	-03

626-0138

AT C, AT D, AT E } SPEC 9
208, 240, 480, 600V., 3PH., 4W., 50/60Hz

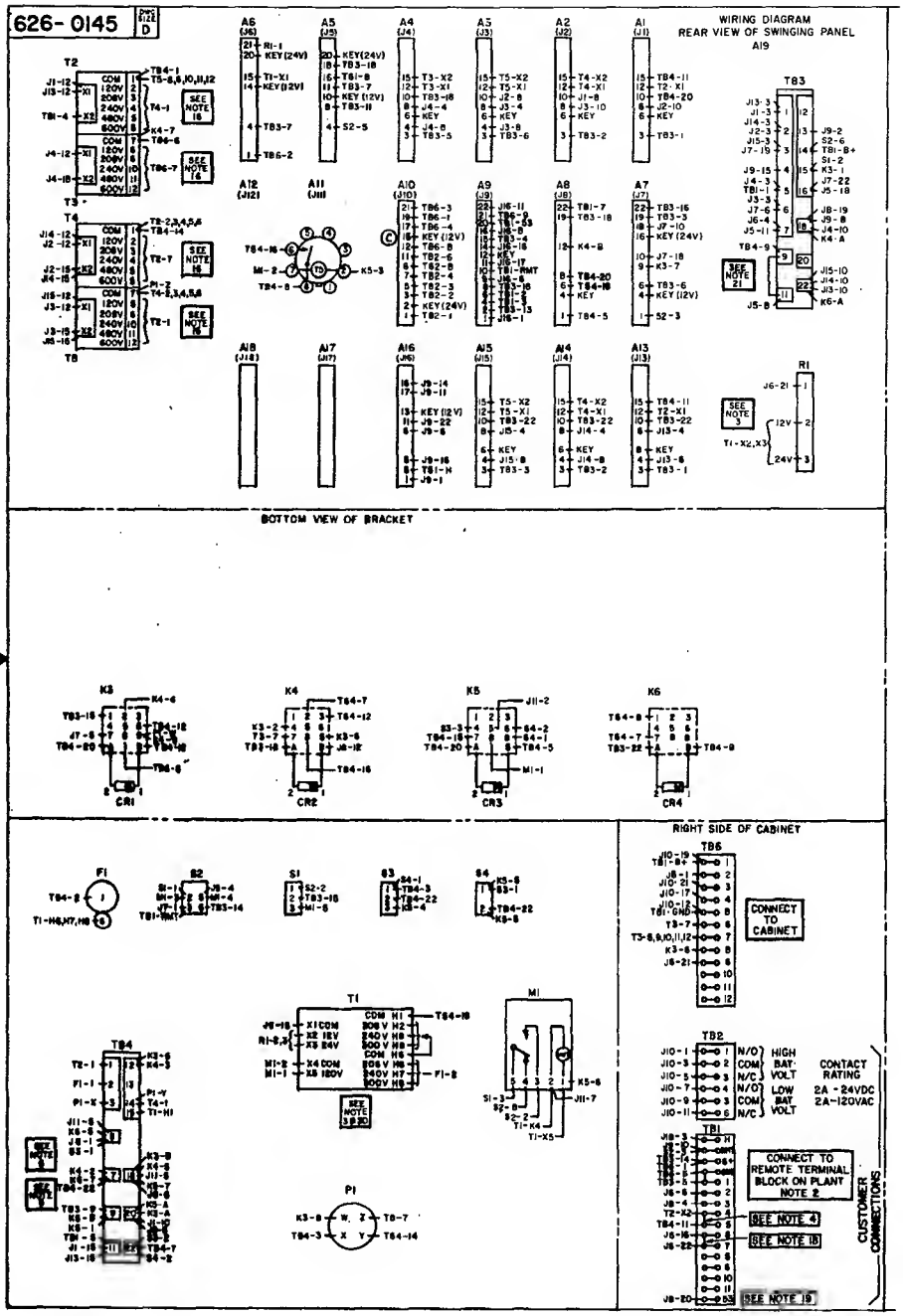
LET	REVISIONS	CHK	APVD	DATE

onan DIVISION OF GMAC CORPORATION

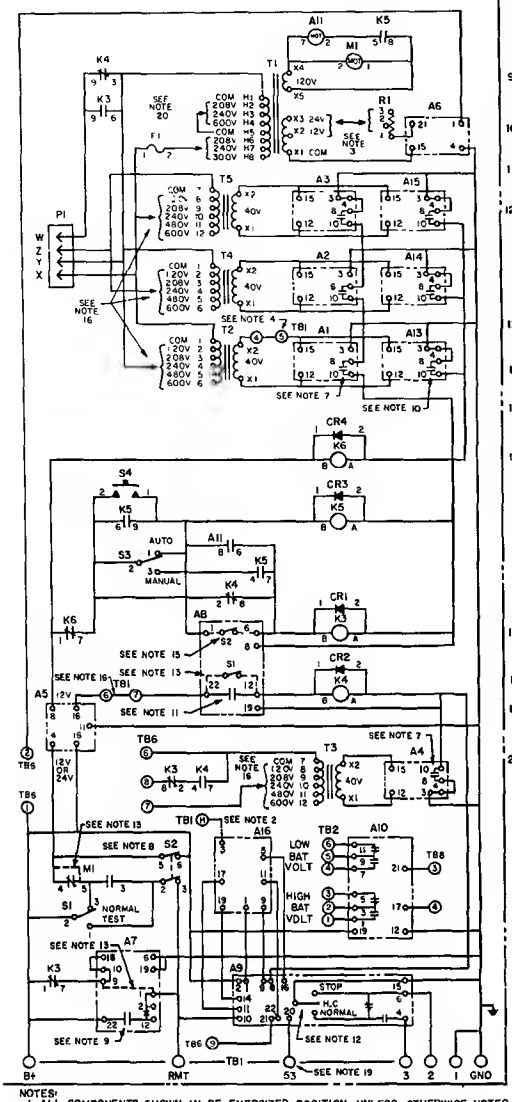
DATE 4-9-74 BY CDR CHK APVD WJD

CONTROL ACCESS. PANEL (WIRING DIAGRAM)

DWG NO 626-0138 REV D


626-0145
SIZE D
WIRING DIAGRAM
REAR VIEW OF SWINGING PANEL
AI9
BOTTOM VIEW OF BRACKET
RIGHT SIDE OF CABINET
CONNECT TO CABINET
CONNECT TO REMOTE TERMINAL BLOCK ON PLANT NOTE 2
CUSTOMER CONNECTIONS
HIGH BAT. VOLT
LOW BAT. VOLT
CONTACT RATING
2A - 24VDC
2A - 120VAC
SEE NOTE 4
SEE NOTE 18
SEE NOTE 19

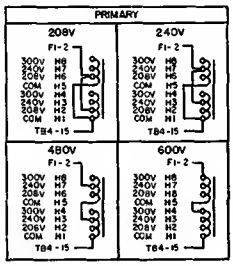
SCHEMATIC DIAGRAM



8. TEST OR EXERCISE (S2 SHOWN IN WITHOUT LOAD POSITION)
   8.1. WITH LOAD-PLANT STARTS AND TAKES OVER LOAD. PLANT RUNS FOR DURATION OF TEST OR EXERCISE PERIOD PLUS ANY TIME DELAYS
   8.2. WITHOUT LOAD- PLANT STARTS AND RUNS FOR DURATION OF TEST OR EXERCISE PERIOD
9. THIS CONTACT SYMBOLIZES A SOLID STATE SWITCH WHICH CLOSES AFTER A 0.5 SEC TO 10 SEC DELAY AND OPENS AFTER A 0.5 MIN TO 5 MIN DELAY
10. THIS CONTACT SYMBOLIZES A SOLID STATE SWITCH THAT CLOSES WHEN VOLTAGE GOES ABOVE NORMAL (A13, A14 & A15)
11. THIS CONTACT SYMBOLIZES A SOLID STATE SWITCH THAT CLOSES AFTER A DELAY OF 0.5 SEC TO 10 SEC DELAY ON LOAD TRANSFER
12. 2 TO 3 WIRE CONVERTER (AT E ONLY)
    THE SELECTOR SW HAS THREE POSITIONS:
    STOP - - - - STOPS PLANT. PREVENTS STARTING. USE THIS POSITION FOR SERVICING PLANT
    NORMAL - - - ALLOWS PLANT TO START. ASSUMES LOAD IF A LINE FAILURE OCCURS.
    HAND CRANK - PREVENTS AUTOMATIC START. ALLOWS STARTING & STOPPING AT THE PLANT. USE THIS POSITION FOR PLANT MAINTENANCE.
13. THIS DASHED LINE REPRESENTS A JUMPER CIRCUIT THAT MUST BYPASS A CONTACT OR CLOSE A CIRCUIT TO OPERATE WITHOUT THE REFERENCED MODULE
14. S2 IS SET IN "ON" POSITION AT FACTORY. WHEN ADDING TD RETRANSFER (MOTOR) TIMER SET 52 TO "OFF" POSITION
15. WHEN ADDING TD TRANSFER WITHOUT A TD RETRANSFER (MOTOR) TIMER ADD WIRE JUMPER BETWEEN TERMINAL 1 & 6 ON THE TD TRANSFER BOARD
16. WIRE TRANSFORMERS T2,3,4 & 5 AS FOLLOWS

FOR 208V CONNECT	T4 - 1 TO T2 - 3
	T6 - 7 TO T3 - 9
	T5 - 7 TO T4 - 3
	T2 - 1 TO T5 - 9
FOR 240V CONNECT	T4 - 1 TO T2 - 4
	T6 - 7 TO T3 - 10
	T5 - 7 TO T4 - 4
	T2 - 1 TO T5 - 10
FOR 480V CONNECT	T4 - 1 TO T2 - 5
	T6 - 7 TO T3 - 11
	T5 - 7 TO T4 - 5
	T2 - 1 TO T5 - 10
FOR 600V CONNECT	T4 - 1 TO T2 - 6
	T6 - 7 TO T3 - 12
	T5 - 7 TO T4 - 6
	T2 - 1 TO T5 - 12

17. WIRING DIAGRAM SHOWS CIRCUIT AS IF ALL ADDER PACKAGES WERE INSTALLED. PLUS IT SHOWS JUMPERS REQUIRED WHEN THEY ARE NOT INSTALLED
18. TO ADD PARALLELING SWITCH BOARD TRANSFER INHIBIT CIRCUIT, REMOVE JUMPER TBI-6 & 7
19. OVERCRANK SIGNAL ON AT E ONLY. CONNECT TO TERMINAL 53 IN REMOTE ANNUNCIATOR
20. WIRE T1 TRANSFORMER AS FOLLOWS:



PARTS LIST				
REF DES	PART NO	REV	QTY	DESCRIPTION
A1,2,3	300-0780	C	3	UNDER VOLTAGE SENSOR (LINE)
A4	300-0780	C	1	UNDER VOLTAGE SENSOR (GEN)
A5	300-0847	B	1	MODULE-VOLTAGE 12V (AT D & E)
	300-0848	B	1	MODULE-24V TO 12V CONVERTER (AT C)
A6	300-0937	B	1	MODULE-BLANK (SPARE)
*	300-0793 (REF)	C	1	BATTERY CHARGER-2 AMP (AT D & E)
*	300-0794 (REF)	C	1	BATTERY CHARGER-2 AMP (AT C)
A7	300-1177	B	1	BYPASS PLUG-START STOP
*	300-0921 (REF)	C	1	TD START-STOP 12V (AT D & E)
*	300-0922 (REF)	C	1	TD START-STOP 24V (AT C)
				0.5 SEC TO 10 SEC DELAY ON START
				0.5 SEC TO 5 MIN DELAY ON STOP
A8	300-0927	B	1	BYPASS PLUG - TRANSFER
				SET S1 ON & S2 (SEE NOTE 14)
*	300-0924 (REF)	C	1	TD TRANSFER (SEE NOTE 15)
				0.5 SEC TO 10 SEC DELAY
A9	300-0937	B	1	MODULE-BLANK (SPARE) (AT C & D)
	300-0926	C	1	2 TO 3 WIRE CONVERTER (AT E)
A10	300-0937	B	1	MODULE-BLANK (SPARE)
*	300-0796 (REF)	C	1	BATTERY VOLTAGE SENSOR (AT D & E)
*	300-0797 (REF)	C	1	BATTERY VOLTAGE SENSOR (AT C)
A11,12	300-0937	B	2	MODULE-BLANK (SPARE)
*				
*	307-1199 (REF)	B	1	ASSY-RETRANSFER 120V 50/60Hz
A13,14,15	300-0937	B	3	MODULE-BLANK (SPARE)
*	300-0780 (REF)	C	1	OVER VOLTAGE SENSOR (LINE)
*	300-0780 (REF)	C	3	OVER VOLTAGE SENSOR (LINE)
A16	300-0937	B	1	MODULE-BLANK (SPARE)
*	300-1072 (REF)	C	1	MODULE-TD PREHEAT
A17,18	300-0937	B	2	MODULE-BLANK (SPARE)
A19	300-1134	C	1	PANEL ASSY-SWINGING
F1	321-0180 (REF)	P	1	FUSE-1 AMP 600V
	321-0179 (REF)	P	1	FUSE-HOLDER
K3	307-1058	B	1	RELAY-INTERPOSING LINE 12V
K4	307-1058	B	1	RELAY-INTERPOSING GEN 12V
K5	307-1058	B	1	RELAY-TIME & RETRANSFER 12V
K6	307-1058	B	1	RELAY-OVER VOLTAGE LINE 12V
M1	301-3487	A	1	PLATE-CLOCK COVER
**	307-1104 (REF)	B	1	CLOCK-PLANT EXERCISER 120V 50Hz
**	307-1102 (REF)	B	1	CLOCK-PLANT EXERCISER 120V 60Hz
P1	323-0901 (REF)	A	1	PLUG-LINE DISCONNECT
R1	353-0046 (REF)	A	1	RESISTOR-6 OHM 2.5 OHM: TAP 75W
S1	308-0321 (REF)	P	1	SWITCH-TEST TRANSFER
S2	308-0322 (REF)	P	1	SWITCH-SELECTOR
S3	308-0321	P	1	SWITCH-MANUAL & AUTO
S4	308-0175	A	1	SWITCH-RETRANSFER
T1	315-0379 (REF)	B	1	TRANSFORMER-BATTERY CHARGER
T2-5	315-0374 (REF)	C	2	TRANSFORMER ASSY-STEPDOWN
TB1	332-1699	A	1	MARKER STRIP
TB2	332-1516	A	1	MARKER STRIP
TB6	332-1469	A	1	MARKER STRIP
	338-0771 (REF)	E	1	HARNESS-MAIN
	338-0664	C	1	HARNESS-RETRANSFER
	338-0657	D	1	HARNESS-OVER V
	338-0658	C	1	HARNESS-BAT V
	338-0677	C	1	HARNESS-MOTOR TIMER
	338-0770	C	1	HARNESS-TD PREHEAT
(D)	332-1276	-	3	PLUG-KEYING
	323-0814	P	16	GUIDES-PC BOARD
	307-1157	P	2	SPRING-RELAY HOLD-DOWN

CONTROL ACCESSORY GROUP: 15
STANDARD
3 UNDER VOLTAGE SENSORS (LINE)
1 UNDER VOLTAGE SENSOR (GEN)
2 TO 3 WIRE CONVERTER (AT E ONLY)
NORMAL-TEST SWITCH
WITHLOAD-WITHOUT LOAD SW
MANUAL PUSH TO RETRANSFER
* PLUG-IN-MODULE PACKAGES
BATTERY CHARGER MODULE

3 OVER VOLTAGE SENSORS (LINE)
TD START 9TDP
TD RETRANSFER (MOTOR)
TO TRANSFER
TO PREHEAT
BATTERY VOLTAGE SENSORS
** WIRE-IN-PACKAGE'S
EXERCISER CLOCK

NOTES:
1. ALL COMPONENTS SHOWN IN DE-ENERGIZED POSITION UNLESS OTHERWISE NOTED
2. 2 WIRE START ON AT C & AT D CONNECT TD B+, GND & RMT. 3 WIRE START ON AT E CONNECT TO B+, 1, 2 & 3 (PLUS H ON DIESELS)
3. FOR 12V BATTERY CONNECT WIRE MARKED T1-X2, X3 R1-2, 3 BETWEEN T1-X2 & R1-2 (AT D & AT E) FOR 24V BATTERY CONNECT WIRE MARKED T1-X2, X3 R1-2, 3 BETWEEN T1-X3 & R1-3 (AT C)
4. TO ADD AREA PROTECTION EQUIPMENT, OR REMOTE TEST TRANSFER SWITCH, REMOVE JUMPER BETWEEN TBI-4 & 5
5. REMOVE JUMPER BETWEEN TB4-7 & 9
6. REMOVE JUMPER BETWEEN TB4-5 & 7
7. THIS CONTACT SYMBOLIZES A SOLID STATE SWITCH THAT CLOSES WHEN VOLTAGE IS NORMAL (A1, A2, A3, & A4)
21. TO ADD OVER & UNDER FREQ SENSING, REMOVE JUMPER BETWEEN TB3-9 & 11

626-0145

REV	DESCRIPTION	DR	CK	DATE
D	332-1276 WAS 332-1279	GR	JV	2-25
C	SIDT WAS M.	CPR	JV	9-25-74
B	A7 WAS 300-0927		JV	8-8-74
A	AS.3 WAS 300-0927		JV	8-8-74

MODEL	SPEC	DATE	CKD
-01 AT C	SPEC B	3-29-74	COR
-02 AT D			
-03 AT E			

Onan DIVISION OF ONAN CORPORATION Minneapolis, Minnesota

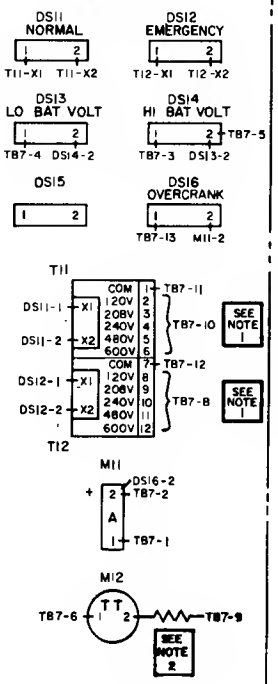
CONTROL ACCESS. PANEL (WIRING DIAGRAM)

208, 240, 480, 600V., 3PH., 50/60Hz

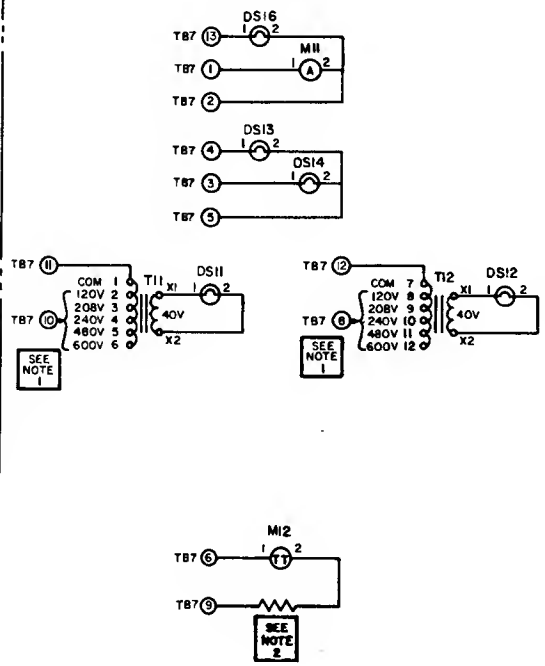
626-0145 REV D

626-0164 DWG SIZE C

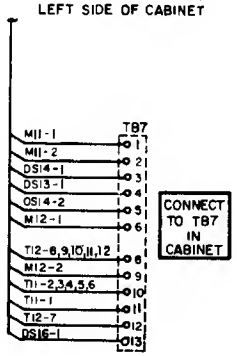
REAR VIEW OF METER PANEL



SCHEMATIC



LEFT SIDE OF CABINET



NOTE:
1. WIRE TRANSFORMER TII & TI2 AS FOLLOWS

FOR 120V, CONNECT TB7-10 TO TII-2
TB7-8 TO TI2-8
FOR 240V, CONNECT TB7-10 TO TII-4
TB7-8 TO TI2-10

2. USE RESISTER WITH RUNNING TIME METER ON 600V ONLY

PARTS LIST

REF. DES.	PART NO	DWG SIZE	QTY	DESCRIPTION
DSII	322-0146	A	1	LAMP - NORMAL 56V
DSI2	322-0147	A	1	LAMP - EMERGENCY 56V
DSI3	322-0114	A	1	LAMP - LO BAT VOLT (14V) (AT D & E)
	322-0126	A	1	LAMP - LO BAT VOLT (28V) (AT C)
DSI4	322-0115	A	1	LAMP - HI BAT VOLT (14V) (AT D & E)
	322-0127	A	1	LAMP - HI BAT VOLT (28V) (AT C)
DSI5	322-0141	A	1	LENS & BEZEL ASSY
DSI6	322-0107	A	1	LAMP - OVERCRANK (14V)
MII	302-0807	A	1	AMMETER - BAT CHARGER 0-2 AMP
MI2	302-0465	P	1	METER-RUNNING TIME (120V) (60Hz)
	302-0466	P	1	METER-RUNNING TIME (240V) (60Hz)
	302-0467	P	1	METER-RUNNING TIME (480V) (60Hz)
	304-0536	A	1	RESISTOR, 9000Ω, 50W (600V) (60Hz) (USE WITH 302-0465 RTM ON 600V)
	302-0468	P	1	METER-RUNNING TIME (120V) (50Hz)
	302-0469	P	1	METER-RUNNING TIME (240V) (50Hz)
	302-0470	P	1	METER-RUNNING TIME (480V) (50Hz)
TII,12	315-0374	C	1	TRANSFORMER ASSY-STEPDOWN
	338-0883	C	1	HARNESS - METER
	338-0661	C	1	HARNESS - LAMPS (NORMAL & EMERGENCY)
	338-0659	B	1	HARNESS - LAMPS (BAT VOLTS)
	301-3505	C	1	PANEL - METER
	98-2413	D	1	SILKSCREEN - METER PANEL
	98-2445	A	1	LABEL - POWER SENTRY

626-0164

METER - LAMP COMBINATION: 16

CHARGE AMMETER
OVERCRANK LAMP (USE ON AT E ONLY)
RUNNING TIME METER

NORMAL & EMERGENCY LAMPS
BATTERY VOLTAGE LAMPS

THIS INFORMATION IS FOR MANUFACTURERS USE ONLY

HERTZ	VOLTAGE	DASH NO
60	120V	-01
60	240V	-02
60	480V	-03
60	600V	-04
50	120V	-05
50	240V	-06
50	480V	-07

LET	REVISION	CHK	ENGR	DATE

PROD REL JIM VINT 7-18-74
ENGR REL
MODEL AT C, AT D, AT E } SPEC B
120, 240, 480, 600V 1 & 3PH 50/60Hz

Onan DIVISION OF ONAN CORPORATION Minneapolis, Minnesota

DATE 7-16-74 | DR DFD | ENGR JIM VINT | CHK CDR

METER LAMP PANEL (WIRING DIAGRAM)

SERIAL PREFIX | DWG NO 626-0164 | DWG SIZE C

MODIFICATIONS

Modifications to the automatic transfer switches are described in this section. At the end of the section, instructions are also given for adding a module to the control accessory panel of groups 11 through 15. For calibration checks and adjustments of new modules or relays, etc., see the *ADJUSTMENTS* section.

WARNING **Throughout any modification, follow the instructions carefully. Otherwise, the automatic transfer switch and generator set present a serious shock hazard.**

CHANGING THREE-PHASE AT TO SINGLE-PHASE

To change a three-phase AT to a single-phase AT, use the following procedure.

1. Move the operation selector switch on the engine control to "STOP."
2. Disconnect the battery cables of the starting batteries.
3. Remove the AC line voltage from the automatic transfer switch.

   WARNING **Be sure to remove AC line voltage from the automatic transfer switch and disable the generator set. Otherwise, the automatic switch presents a serious shock hazard.**

4. Open the cabinet doors of the automatic transfer switch.
5. Remove the transfer switch terminal guard covers.
6. Remove generator, line and load connections from the transfer switch terminal C.
7. Connect single-phase generator, line, and load connections to respective terminals A and B. Make sure single-phase voltage matches transfer switch voltage.

   CAUTION **Incorrect voltage may damage transfer switch.**

8. Re-install the terminal guard covers.
9. Remove the control disconnect plug and open the control accessory panel.
10. *Control Accessory Groups 01 Through 05:* When changing phase of an AT with one of these control accessory panels, replace the panel with one matching the singe-phase voltage. See *Changing Control Accessory Panel.*

    Control Accessory Groups 11 Through 15: For control accessory panels with plug-in modules, remove undervoltage sensors 2 and 3 (if equipped). Insert 300-0927 bypass plug modules into the module openings 2 and 3.

    If a different generator set is used with a different voltage starting system, See *Changing Control Accessory Panel DC System Voltage.*

11. Close the control accessory panel and reconnect the control disconnect plug.
12. If the meter-lamp panel is three-phase only, remove the panel as described under *Changing Meter-Lamp Panel.* If the meter-lamp panel is a single- or single- and three-phase panel, rewire the connections on transformers T11 and T12 (if equipped). See Figure 1.

    a. For 120 volts, reconnect lead from TB7-10 to T11-2, and reconnect lead from TB7-8 to T12-8.
    b. For 240 volts, reconnect lead from TB7-10 to T11-4, and reconnect lead from TB7-8 to T12-10.

13. Close the cabinet doors.

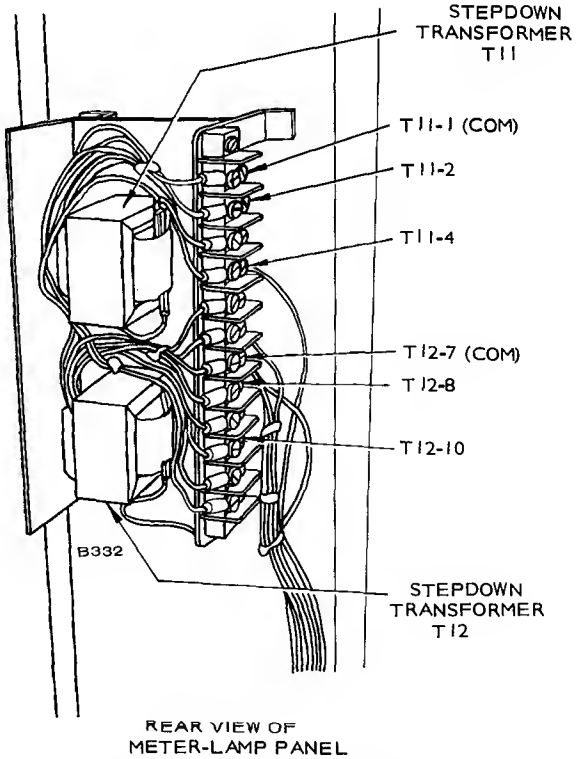


FIGURE 1. STEPDOWN TRANSFORMERS T11 AND T12 ON METER-LAMP PANEL

14. Restore AC line voltage to the automatic transfer switch.
15. Reconnect the starting batteries.
16. Move the operation selector switch on the engine control to "RMT."

CHANGING METER-LAMP PANEL

To change a meter-lamp panel in an automatic transfer switch, use the following procedure.

1. Open the front doors of the cabinet.
2. Move operation selector switch on engine control to "STOP."
3. Disconnect the starting batteries.
4. Remove the AC line voltage from the automatic transfer switch.

WARNING **Be sure to remove the AC line voltage from the automatic transfer switch. Otherwise, the transfer switch has high voltages and presents a serious shock hazard.**

5. Disconnect the meter-lamp panel wire leads from TB7. See Figure 2.
6. Remove the nuts and washers holding the meter-lamp panel and remove panel.
7. Mount the new meter-lamp panel using the same nuts and washers.
8. Connect the wire leads as marked, from the meter-lamp panel's wiring harness to TB7.
9. Restore AC line voltage to the automatic transfer switch.
10. Move the operation selector switch on engine control to "RMT."
11. Close cabinet doors.

CHANGING CONTROL ACCESSORY PANEL

Panel Groups 01 Through 05

The new panel installed must match AC system voltage and start control (2- or 3-wire).

1. Move the operation selector switch on engine control to "STOP."
2. Disconnect the ground cable of the starting batteries.
3. Remove AC voltage from the automatic transfer switch.

WARNING **Failure to remove AC power from the automatic transfer switch and to disable the generator set presents a serious shock hazard during this modification.**

4. Open cabinet doors of automatic transfer switch.
5. Remove the twist-lock disconnect plug and open control accessory panel.
6. Remove the external wires from TB1 and TB6, then remove the terminal blocks from mounting. See Figure 3.
7. Hold the flange edge of the control accessory panel's bottom hinge pin with a needle-nose pliers (just above nylon spacer) and remove

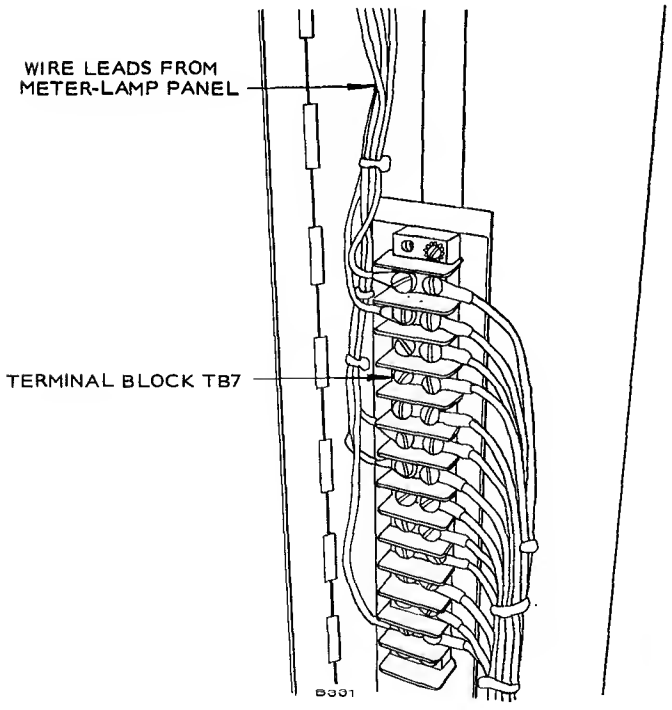


FIGURE 2. METER-LAMP PANEL TERMINAL BLOCK TB7

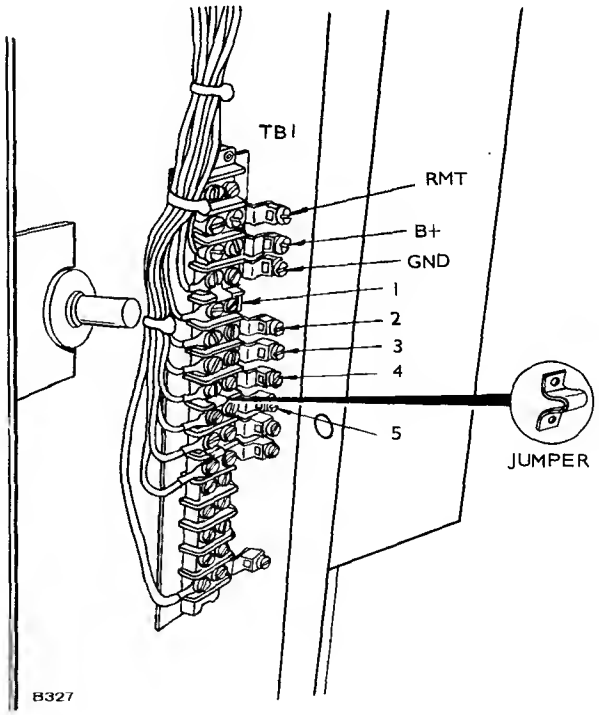


FIGURE 3. LOCATION OF TERMINAL BLOCK TB1

screw from pin with a screwdriver. The pliers prevent the pin from turning when loosening the screw (Figure 4).

WARNING **When screw is removed, control accessory panel is loose on bottom. Have someone holding the panel during removal procedures to prevent personal injury.**

8. Carefully pull outward on bottom of control accessory panel until it clears cabinet.
9. Lower control accessory panel from cabinet. Top hinge pin will come out with control accessory panel.
10. Remove the top hinge pin from control accessory panel and install on new panel if required.
11. Lift up new control accessory panel into cabinet, carefully engaging top hinge pin.
12. Center the hole of the bottom control accessory panel's flange over hinge pin.
13. Insert the screw in bottom hinge pin and tighten with screwdriver and pliers.
14. Install terminal boards TB1 and TB6 (from new control accessory panel). Connect loose wires in cabinet to terminal blocks as marked.
15. If an area protection circuit or a remote test switch is used, remove the jumper between terminals TB1-4 and -5, and connect the wire leads from the equipment.
16. Close the control accessory panel and reconnect the twist-lock disconnect plug.
17. Set the time delays following instructions in the *ADJUSTMENTS* section.
18. Restore AC line voltage to the automatic transfer switch.
19. Reconnect the ground cable of the starting batteries.
20. Move the operation selector switch on the engine control to "RMT."
21. Close cabinet doors of automatic transfer switch.

Panel Groups 11 Through 15

1. Open automatic transfer switch right cabinet door.
2. Move operation selector switch on engine control to "STOP."
3. Remove AC line voltage from the automatic transfer switch and disconnect the battery.

WARNING **Be sure to remove AC line voltage from the automatic transfer switch. Otherwise, the transfer switch has high voltages and presents a serious shock hazard.**

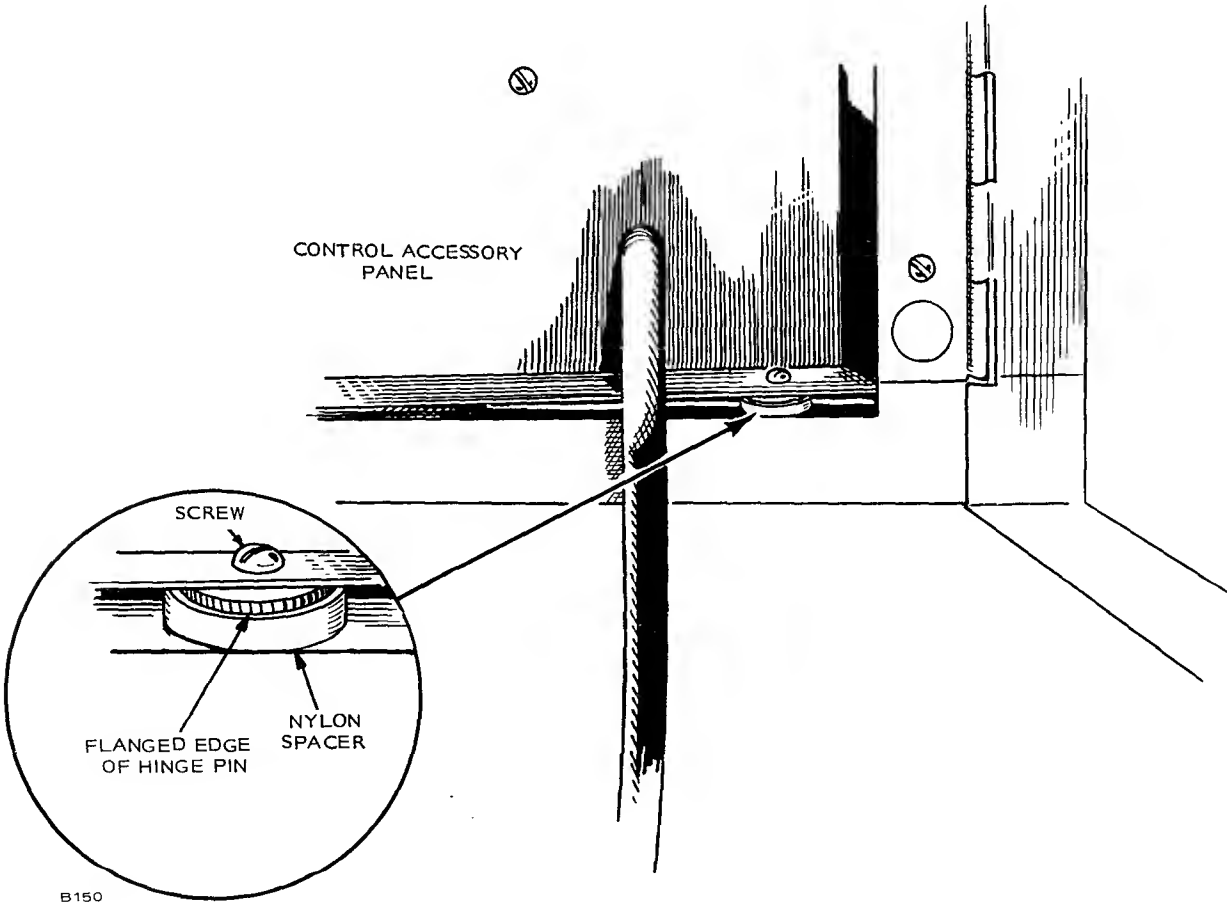


FIGURE 4. BOTTOM HINGE PIN FOR CONTROL ACCESSORY PANEL

4. Remove the twist-lock disconnect plug and pull the control accessory panel open.
5. Remove external wires from TB1, TB2, and TB6 (if all present), then remove these terminal blocks from mounting. See Figure 3.
6. Hold the flange edge of the control accessory panel's bottom hinge pin with a needle-nose pliers (just above nylon spacer) and remove screw from pin with a screwdriver. The pliers prevent the pin from turning when loosening the screw (Figure 4).

WARNING **When screw is removed, control accessory panel is loose on bottom. Have someone holding the panel during removal procedures to prevent personal injury.**

7. Carefully pull outward on bottom of control accessory panel until it clears cabinet.
8. Lower control accessory panel from cabinet. Top hinge pin will come out with control accessory panel.
9. Remove the top hinge pin from control accessory panel and install on new panel if required.
10. Lift up new control accessory panel into cabinet, carefully engaging top hinge pin.
11. Center the hole of the bottom control accessory panel's flange over hinge pin.
12. Insert the screw in bottom hinge pin and tighten with screwdriver and pliers.
13. Install the terminal boards (from new control accessory panel) on the wall of the cabinet, using #6-32 screws. TB2 mounts just above TB1 remote terminal block.
14. Connect loose wire leads to terminal blocks as marked.
15. If the AC voltage of the new control accessory panel is different, see *Changing Control Accessory Panel AC Voltage.*
16. If the DC system voltage and number wire start is different on the new control panel, see *Changing Control Accessory Panel DC System Voltage* and/or *Three to Two Wire Start Conversion (12 Volts).*
17. For external alarms or signal circuits of the battery voltage sensors, connect lead wires to TB2. These contacts are rated 2 amperes for 12 volts DC or 120 volts AC.
18. Close the control accessory panel and reconnect the twist-lock disconnect plug.
19. Restore AC line voltage to the automatic transfer switch and reconnect the battery.
20. Move operation selector switch on engine control to "RMT."
21. Close cabinet door.

CHANGING CONTROL ACCESSORY PANEL AC SYSTEM VOLTAGE

This modification applies only to control accessory panels in groups 11 through 15.

If the control accessory panel has been changed and its nominal voltage differs from the automatic tranfer switch, use the following procedure:

1. Open right cabinet door of automatic transfer switch.
2. Move the operation selector switch to "STOP" (on generator set engine control).
3. Remove AC line voltage from the automatic transfer switch.

WARNING **Be sure to remove AC line voltage from the automatic transfer switch. Otherwise, the transfer switch has high voltages and presents a serious shock hazard.**

4. Remove the twist-lock disconnect plug and pull the control accessory panel open.
5. Rewire the stepdown transformers T2, T3, T4, and T5 using the wiring diagram furnished with the control accessory panel. Change the wire lead connections on the right side (facing panel rear) of the terminal strip for the transformers. See Figure 5.
6. Rewire battery charger transformer T1 so the wire from F1-2 and T1-H5 (COM) go to the appropriate connections on the transformer for the nominal AC voltage (Figure 6). See the wiring diagram for the correct connections.
7. Close the control accessory panel.
8. Reconnect the twist-lock disconnect plug.
9. Restore AC line voltage to the automatic transfer switch.
10. Move the operation selector switch on the engine control to "RMT."
11. Close the cabinet door.

CHANGING CONTROL ACCESSORY PANEL DC SYSTEM VOLTAGE

This modification applies only to control accessory panels in groups 11 through 15.

From 24 to 12 Volts

1. Open the cabinet doors of the automatic transfer switch.
2. Move operation selector switch to "STOP" (on engine control).

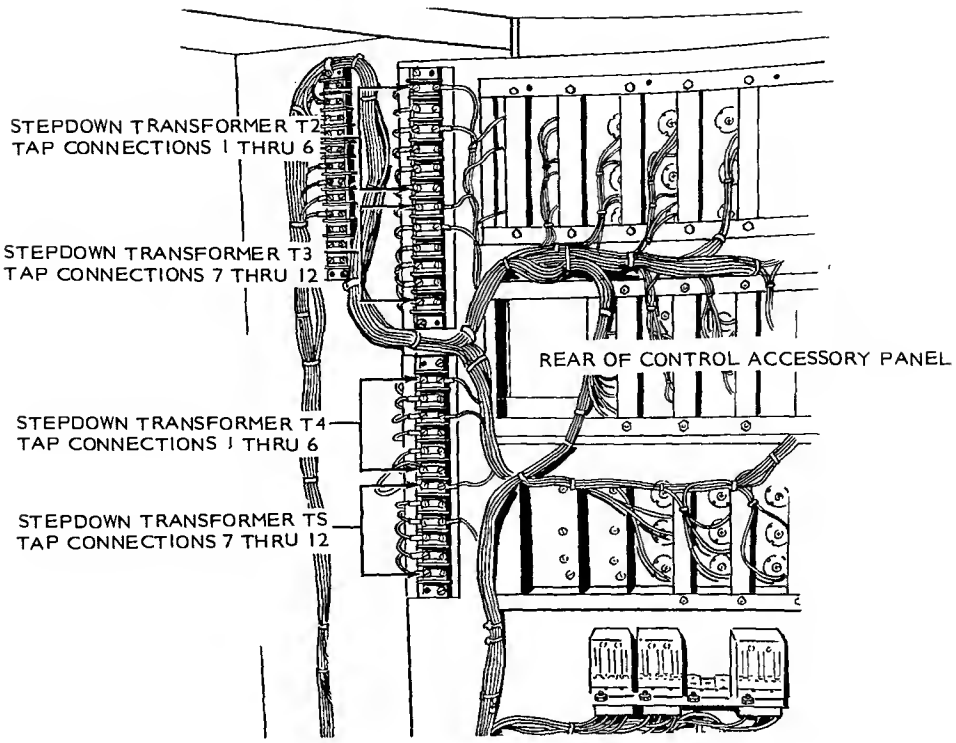


FIGURE 5. AC VOLTAGE CONNECTIONS FOR STEPDOWN TRANSFORMERS

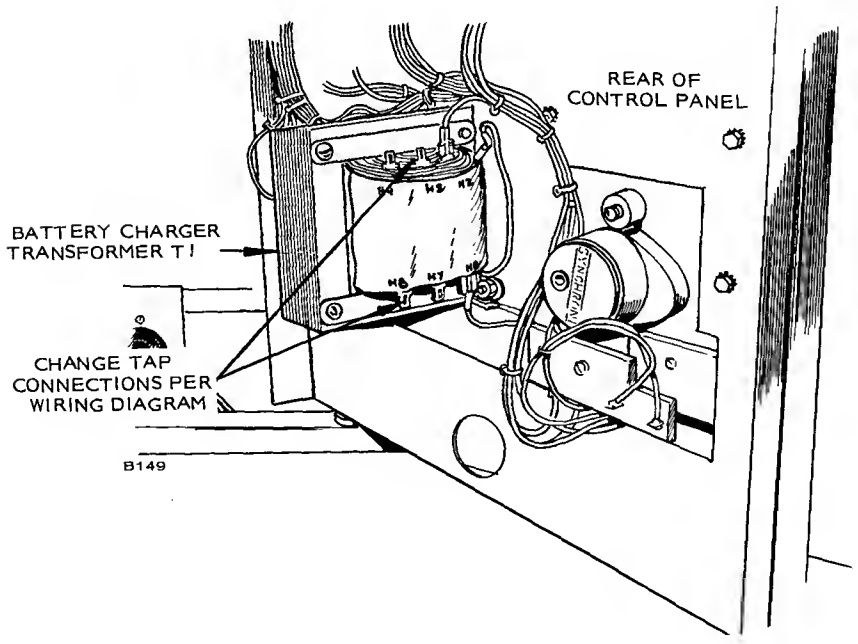


FIGURE 6. BATTERY CHARGER TRANSFORMER AC CONNECTIONS

3. Remove AC line voltage from the automatic transfer switch.

WARNING **Be sure to remove AC line voltage from the automatic transfer switch. Otherwise, the transfer switch has high voltages and presents a serious shock hazard.**

4. Remove the twist-lock disconnect plug and open the control accessory panel.
5. Remove the wire lead from transformer T1 terminal T1-X3 and connect to terminal T1-X2 (Figure 7).
6. Remove the wire lead from resistor R1 terminal R1-3 and connect to terminal R1-2. See Figure 8.
7. Remove the 24-volt battery charger module 6 (number 300-0794) and replace with the 12-volt module, number 300-0793.
8. Remove the 24 to 12-volt converter module 5 (number 300-0848) and replace with the 12-volt module, number 300-0847.
9. Remove the 24-volt, start-stop time delay module 7 (number 300-0922) and replace with the 12-volt time delay module 300-0921.
10. If module 10 is a 24-volt battery voltage sensor, number 300-0797, remove and replace it with a 12-volt, number 300-0796 sensor module.
11. Remove "LO BAT VOLT" lamp DS13 and "HI BAT VOLT" lamp DS14 from the meter-lamp panel and replace with 322-0114 and 322-0115 lamps respectively.
12. Close the control accessory panel and reconnect the twistlock disconnect plug.
13. Connect a 12-volt battery and restore AC line voltage to the automatic transfer switch.
14. Move the operation selector switch on engine control to "RMT."
15. Close cabinet doors.

From 12 Volts to 24 Volts

1. Open the cabinet doors.
2. Move operation selector switch on engine control to "STOP."
3. Remove AC line voltage from the automatic transfer switch.

WARNING **Be sure to remove AC line voltage from the automatic transfer switch. Otherwise, the transfer switch has high voltages and presents a serious shock hazard.**

4. Remove the twist-lock disconnect plug and open the control accessory panel.
5. Remove the wire lead from transformer T1 terminal T1-X2 and connect to terminal T1-X3 (Figure 7).
6. Remove the wire lead from resistor R1 terminal R1-2 and connect to terminal R1-3. See Figure 8.
7. Remove the 12-volt battery charger module 6 (number 300-0793) and replace with the 24-volt module, number 300-0794.

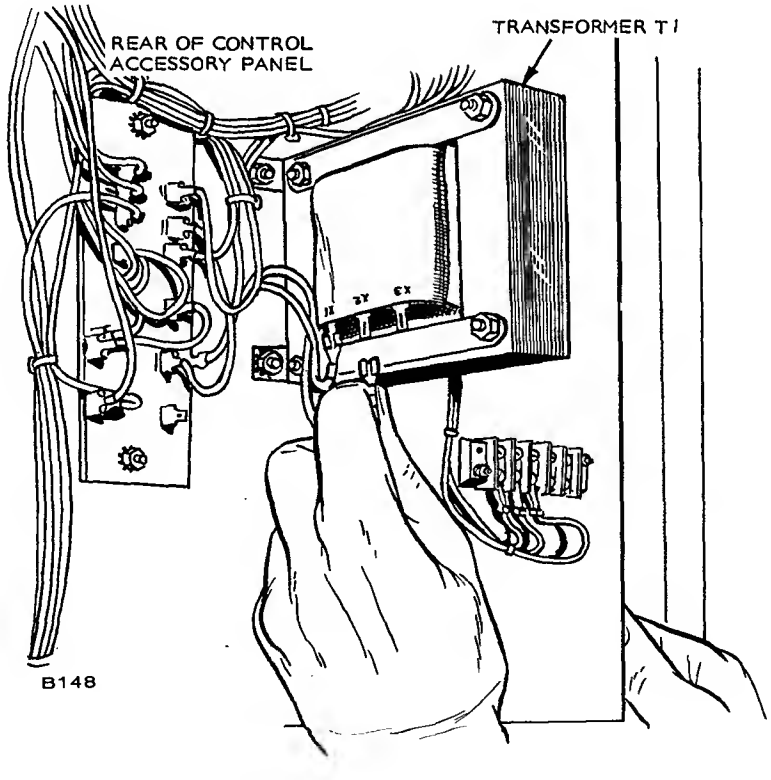


FIGURE 7. BATTERY CHARGER TRANSFORMER DC CONNECTIONS

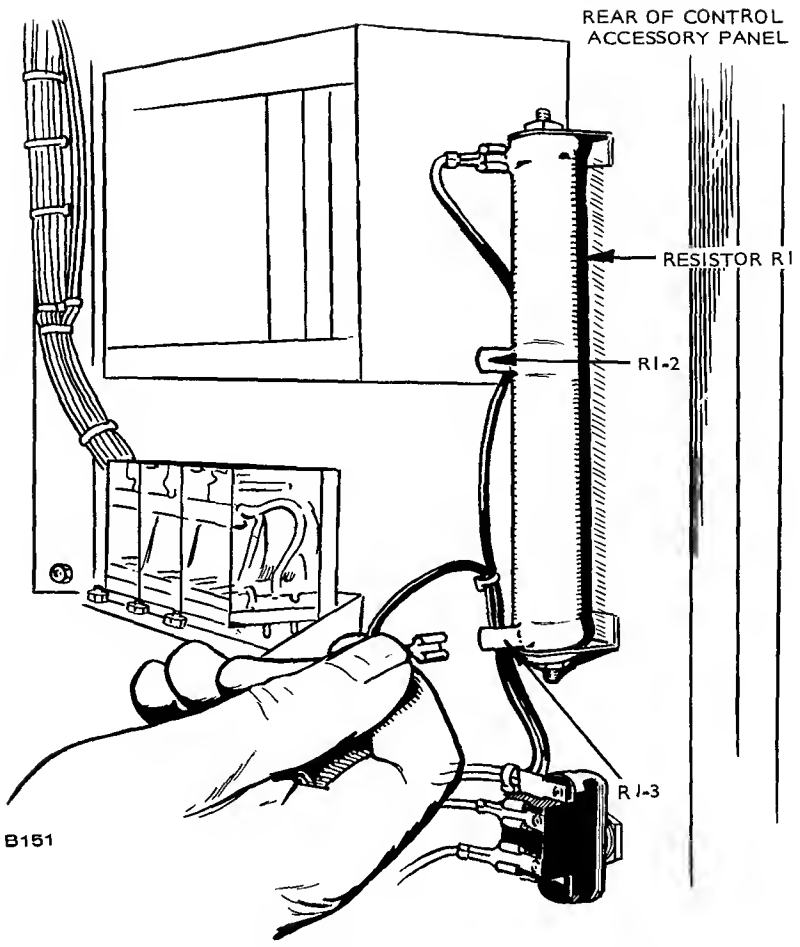


FIGURE 8. CHANGING RESISTOR R1 TAP SETTING

8. Remove the 12-volt module 5 (number 300-0847) and replace with the 24 to 12-volt converter module, number 300-0848.
9. Remove the 12-volt, start-stop time delay module 7 (number 300-0921) and replace with the 24-volt time delay module 300-0922.
10. If module 9 is a 2 to 3 wire converter, number 300-0926, remove and replace with a blank (spare) 300-0937 module.
11. If module 10 is a 12-volt battery voltage sensor, number 300-0796, remove and replace it with a 24-volt, number 300-0797 sensor module.
12. Remove "LO BAT VOLT" lamp DS13 and "HI BAT VOLT" lamp DS14 from the meter-lamp panel and replace with 322-0126 and 322-0127 lamps respectively.
13. Close the control accessory panel and reconnect the twist-lock disconnect plug.
14. Connect a 24-volt battery and restore AC line voltage to the automatic transfer switch.
15. Move the operation selector switch on engine control to "RMT."
16. Close cabinet doors.

THREE TO TWO WIRE START CONVERSION (12 VOLTS)

This procedure applies only to control accessory panels in groups 11 through 15.

For a conversion from three-wire, 12-volt system to a two-wire, 24-volt system, perform the *Changing Control Accessory Panel DC System Voltage* first, then proceed to the following:

1. Open cabinet door.
2. Move the operation selector switch on 2 to 3 wire converter module 9 to "STOP" and disconnect the battery.
3. Remove AC line voltage from the automatic transfer switch.

WARNING **Be sure to remove AC line voltage from the automatic tranfer switch. Otherwise, the transfer switch has high voltages and presents a serious shock hazard.**

4. Remove the wire leads between the engine control remote terminal block and the automatic transfer switch remote terminal block TB1.

5. Remove 300-0926 2 to 3 wire converter module 9 and replace it with a 300-0937 blank (spare) module.
6. Connect automatic transfer switch terminals TB1-B+, -RMT and -GND to the 2-wire start engine control.
7. Restore AC line voltage and reconnect the battery.
8. Move the operation selector switch on the engine control to "RMT."
9. Close cabinet door.

ADDING MODULE IN CONTROL ACCESSORY PANEL

This procedure applies only to control accessory panels in groups 11 through 15.

When adding a plug-in module in the control accessory panel where there previously was a blank (spare), be sure to use the following procedure.

1. Open the cabinet door.
2. Move operation selector switch on engine control to "STOP" and disconnect starting battery.
3. Remove AC line voltage from the automatic transfer switch.

WARNING **Be sure to remove AC line voltage from the automatic transfer switch. Otherwise, the transfer switch has high voltages and presents a serious shock hazard.**

4. Remove the twist-lock disconnect plug and open control accessory panel.
5. Install 332-1276 keying plug(s) in the slot(s) of the printed circuit board receptacle as needed. Figure 9 shows how a keying plug is inserted into the receptacle. See a control accessory panel wiring diagram showing location of the keying plug(s) for that particular module.
6. Insert the new module in the control accessory panel.

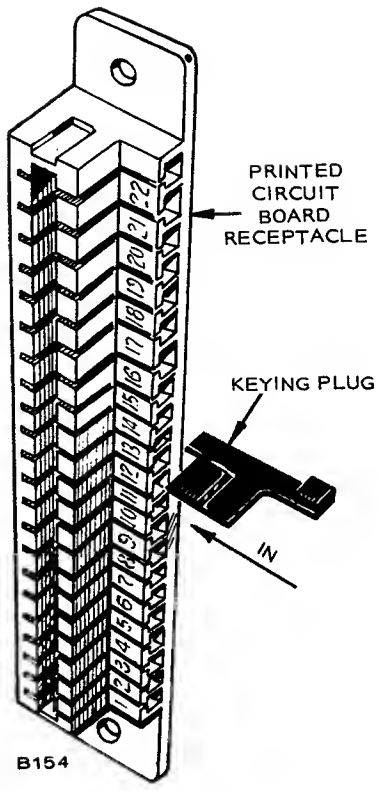


FIGURE 9. INSTALLATION OF KEYING PLUG

7. Restore AC line voltage to the automatic transfer switch.
8. Close the control accessory panel and reconnect the disconnect plug.
9. Move the operation selector switch on engine control to "RMT."
10. Close cabinet door.

ADJUSTMENTS

See the *TRANSFER SWITCH* section for maintenance, repair or adjustments of the transfer switch mechanism.

LATCH AND LATCH PIN ADJUSTMENT

If the control accessory panel will not close because the latch is above or below the latch pin, perform the following.

1. Open right cabinet door of automatic transfer switch.
2. Move operation selector switch to "STOP" (on engine control) and disconnect starting battery.
3. Remove AC line voltage from the automatic transfer switch.

WARNING **Be sure to remove AC line voltage from the automatic transfer switch. Otherwise, the transfer switch has high voltages and presents a serious shock hazard.**

4. Remove the twist-lock disconnect plug.
5. Completely open the control accessory panel.
6. Loosen the latch pin on the left side of the control cabinet, and move the latch pin up or down in the slot as necessary (Figure 10). Then tighten.
7. Close the control accessory panel. If more adjustment is necessary, repeat Steps 5 and 6.
8. Reconnect the twist-lock disconnect plug.
9. Restore AC line voltage to the automatic transfer switch.
10. Move operation selector switch to "RMT" (on engine control).
15. Reconnect starting battery.
16. Close cabinet door.

EXERCISER CLOCK

1. Open the right cabinet door of the automatic transfer switch.
2. Move the operation selector switch (on engine control) to "STOP."
3. Install a trip pin (left-hand thread) in the inside row of holes on the large dial for the time of day you want the generator set to start. See Figure 11.

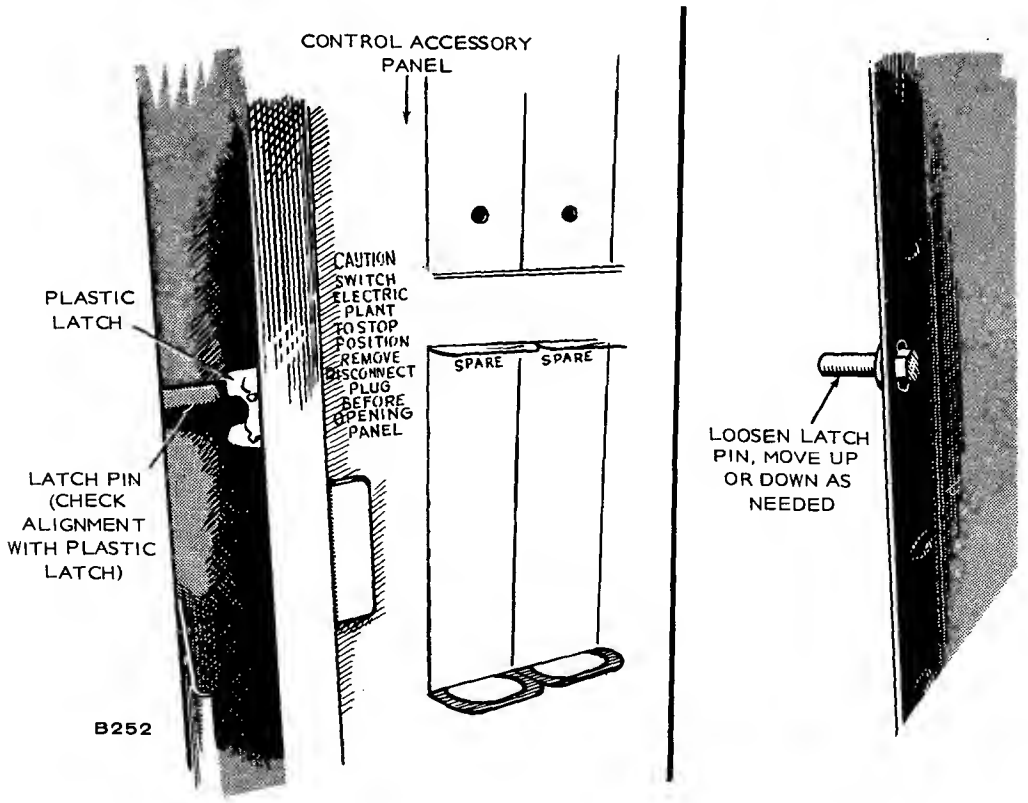
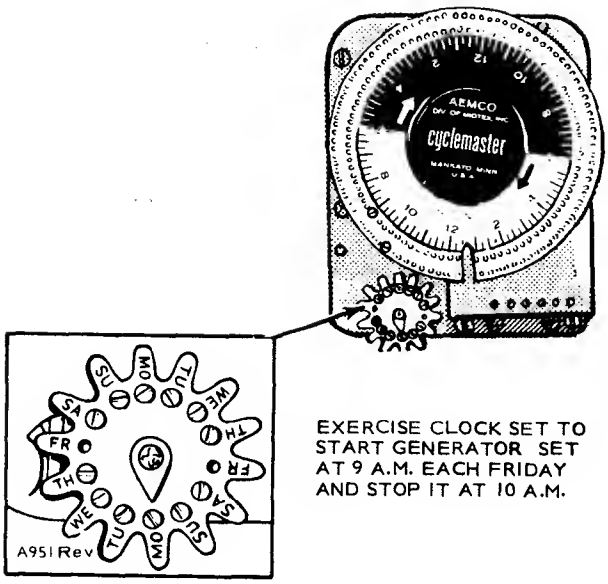


FIGURE 10. ADJUSTMENT OF LATCH PIN



EXERCISE CLOCK SET TO START GENERATOR SET AT 9 A.M. EACH FRIDAY AND STOP IT AT 10 A.M.

FIGURE 11. EXERCISER CLOCK

4. Place a trip pin in the outside row of holes on the large dial to stop the generator set.

   Onan recommends settings which operate the generator set for at least 30 minutes each week. Exercising for one long period is better than several short periods.

5. Install a trip pin in the small spoked wheel for every day *no exercise* is desired.
6. Rotate the large dial clockwise until the correct time is correctly aligned with the timer pointer.
7. Align the small spoked wheel with the correct day at its pointer.

   Sixteen trip pins are supplied with the clock. Store unused pins on the time pointer bracket.

8. Move the operation selector switch on engine control to "RMT."
9. Close the cabinet door.

TIME DELAYS

The auxiliary transfer and retransfer time delay assembly can be used for an AT with a control accessory panel in groups 01 through 05, or 11 through 15. For the other time delays, follow instructions under *Control Accessory Groups 01 Through 05* **or** *Control Accessory Groups 11 Through 15,* **whichever applies.**

Auxiliary Transfer And Retransfer Time Delay Assembly

Both auxiliary transfer and retransfer time delays can provide 1 to 300 seconds of no power to loads during transfer or retransfer of transfer switch operation. For adjustment of either time delay, use the following procedure.

1. Move the operation selector switch on engine control to "STOP" and disconnect starting battery.
2. Remove AC line power to the automatic transfer switch.

   WARNING **Be sure to move the operation selector switch to "STOP," disconnect starting battery, and remove AC line power before attempting adjustments. Otherwise, the automatic transfer switch presents a serious shock hazard.**

3. Open both cabinet doors of automatic transfer switch.
4. Remove the six screws, control cover and terminal guard from the transfer switch control box (just below transfer switch motors).
5. Locate the time delay assembly below the transfer switch on rear panel of cabinet. Transfer time delay K11 (for line side) is located on the left, time delay K12 (for generator side) is on the right.
6. Adjust the time delay.
7. Reinstall the transfer switch control box cover and terminal guard with the six screws removed in Step 4.
8. Close cabinet doors.
9. Restore AC line voltage to automatic transfer switch.
10. Reconnect starting battery.
11. Move the operation selector switch (on engine control) to "RMT."

Control Accessory Groups 01 Through 05

Start and Transfer Time Delays: Both of these motor-driven time delays require the same adjustments procedures. Settings can range from 1 to 300 seconds *(OPERATION* section lists suggested settings). To make settings, perform the following.

1. Open the right cabinet door of the automatic transfer switch.
2. Turn the knob on the time delay clockwise to increase delay time, counterclockwise to decrease the delay time. See Figure 12.
3. Close the cabinet door.

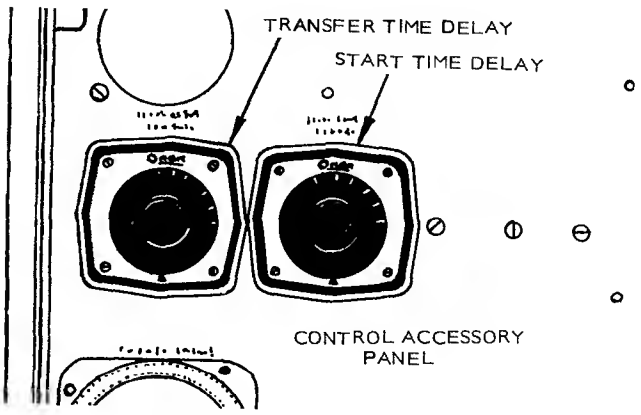


FIGURE 12. START AND TRANSFER TIME DELAY RELAYS

Stop and Retransfer Time Delays: Both of these synchronous motor-driven time delays require the same adjustment procedure. Settings can range from 2 to 60 minutes (*OPERATION* section lists suggested settings). To make settings, perform the following.

1. Open the cabinet door of the automatic transfer switch.
2. Set the time delay by turning the adjustment knob in the center of the delay. See Figure 13.

   The black pointer on the face of the time delay indicates the preset delay. The red pointer indicates the delay time left in operation.

3. Close the cabinet door.

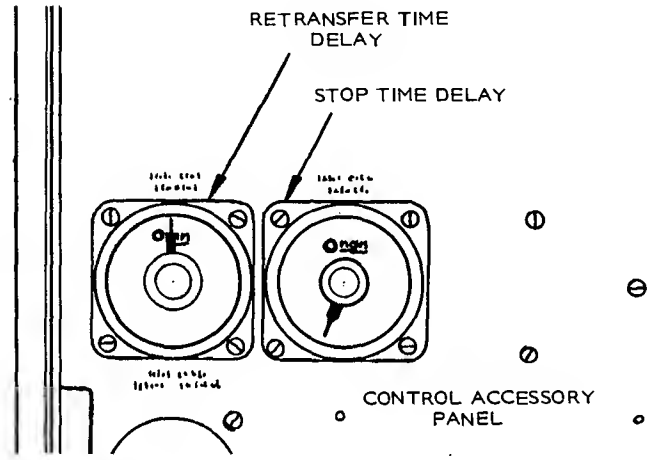


FIGURE 13. STOP AND RETRANSFER TIME DELAY RELAYS

Control Accessory Groups 11 Through 15

Start-Stop Time Delay: Time delay for start is factory adjusted for 2 to 3 seconds. Time delay on stop is factory adjusted for 4.5 to 5 minutes. If other times are desired, use the following procedure.

1. Open the right cabinet door of automatic transfer switch.
2. Move selector switch to "WITH LOAD."
3. Move test transfer switch to "TEST."
4. With a stop watch or watch with a second hand, measure the time until the generator set starts cranking.
5. Insert a small screwdriver through "START" hole in front panel of start-stop time delay module 7. Turn "START" potentiometer clockwise to increase start time delay or counterclockwise to decrease start time delay. Make adjustments in small increments.
6. Move test transfer switch to "NORMAL."
7. Measure time until generator set begins to shut down.
8. Turn "STOP" potentiometer with the small screwdriver clockwise to increase the stop time delay or counterclockwise to decrease the stop time delay. Make adjustments in small increments.
9. Repeat Steps 2 through 8 until desired delay times are obtained.
10. Move selector switch to desired position, "WITHOUT LOAD" or "WITH LOAD."
11. Close cabinet door.

Transfer Time Delay: For adjustment or change of time delay for transfer (transfer of the load to the generator set) from the standard setting, two to three seconds, use the following procedure.

1. Open right cabinet door of automatic transfer switch.
2. Move operation selector switch to "STOP" (on engine control).
3. Move selector switch to "WITH LOAD."
4. Remove the twist-lock disconnect plug.
5. Open the control accessory panel.
6. Locate generator interposing relay K4 (Figure 14).
7. Reconnect the twist-lock disconnect plug with the control accessory panel open.

   WARNING **Rear of the control accessory panel and transfer switch are energized. Do not touch due to shock hazard!**

8. Move operation selector switch to "RMT."
9. Move test transfer switch to "TEST." Generator set will start and run.
10. With a stopwatch or watch with a second hand, measure time from instant generator set reaches full speed until relay K4 contacts close. If time delay is correct or time you desire, proceed to Step 14. If not, proceed to Step 11.
11. Insert a small screwdriver through hole in front panel of transfer time delay module 8. Turn clockwise in small increments to increase the time delay, counterclockwise to decrease the time delay.
12. Move the test transfer switch to "NORMAL" to stop the generator set.
13. Repeat Steps 9 through 12 until the desired time delay is obtained.
14. Move the test transfer switch to "NORMAL."
15. Move operation selector switch to "STOP."
16. Remove the disconnect plug and close the control accessory panel.
17. Reconnect the disconnect plug.
18. Move the operation selector switch to "RMT."
19. Return selector switch to desired position, "WITHOUT LOAD" or "WITH LOAD."
20. Close cabinet door.

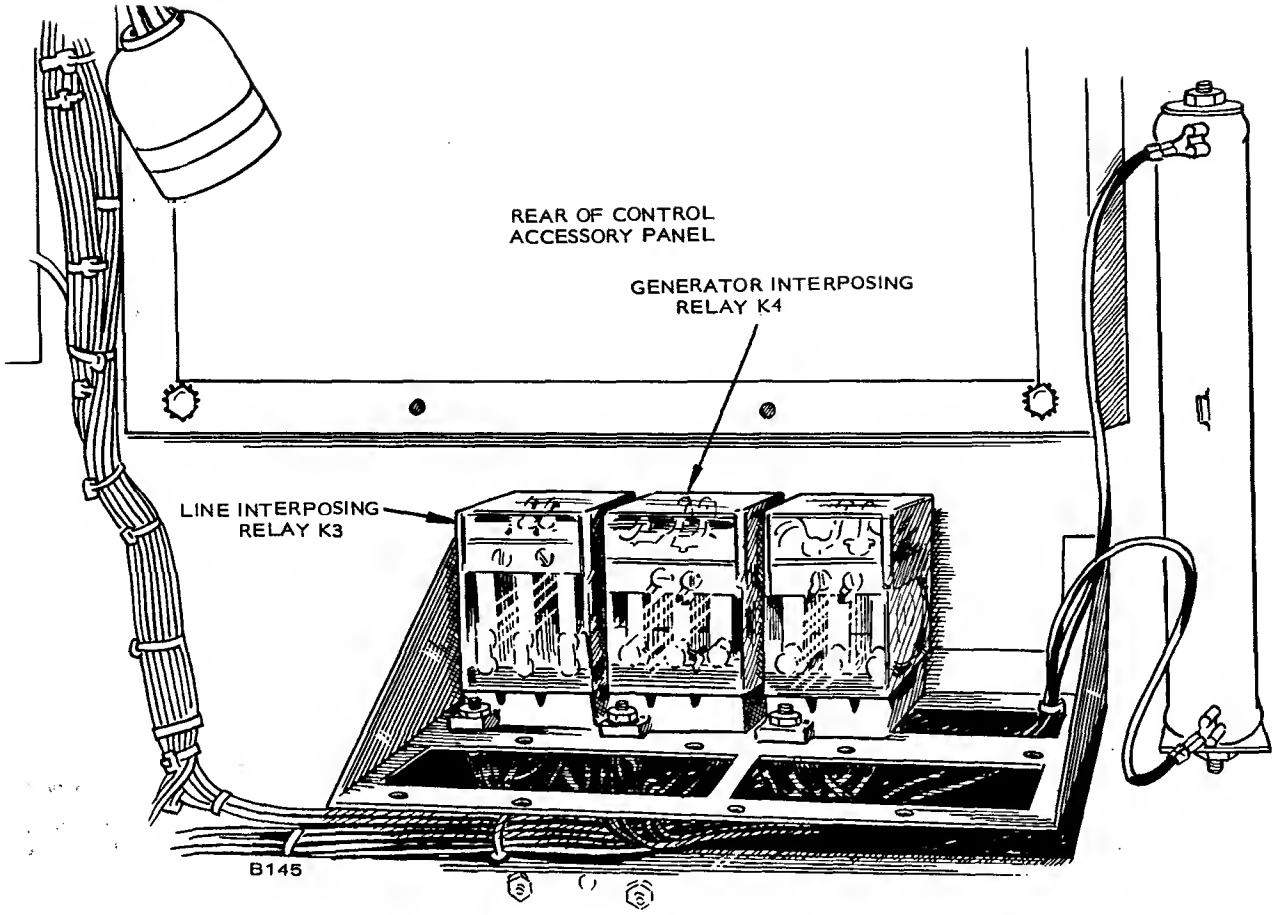


FIGURE 14. LOCATION OF INTERPOSING RELAYS

Retransfer Time Delay: The retransfer time delay can be used to provide 0 to 30 minutes (36 minutes for 50 hertz) time delay on retransfer (retransfer of load to commercial power line). See the *OPERATION* section for operation description.

Shown in Figure 15 is the retransfer time delay with one lamp ("POWER ON") and a time adjustment knob. The adjustment knob has a black pointer and a red time-remaining indicator pointer. Turn the adjustment knob clockwise until the black pointer aligns with the desired time delay.

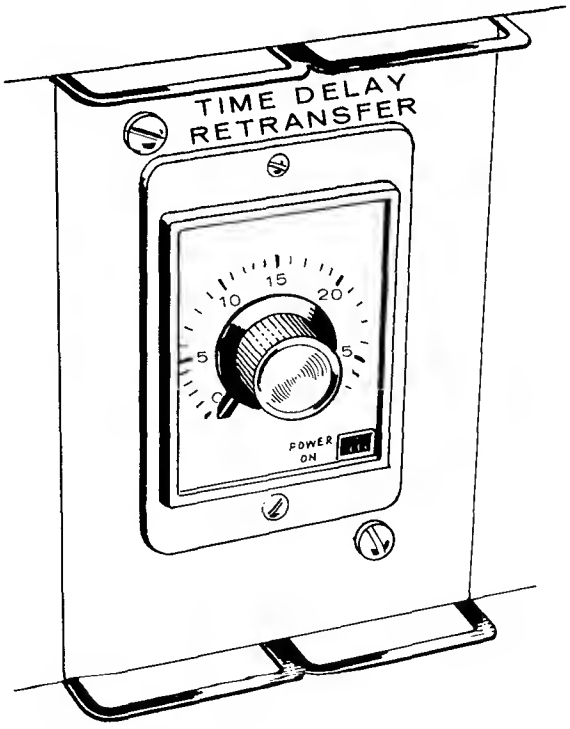


FIGURE 15. RETRANSFER TIME DELAY

BATTERY FLOAT CHARGE

For the following adjustments, a fully-charged battery, a hydrometer and an accurate voltmeter (1/2 percent accuracy) are needed. Onan recommends float voltages of: 13.3 volts for nominal 12-volt or 26.6 volts for nominal 24-volt lead-acid batteries; 13.8 to 14.5 volts for 10-cell nickel-cadmium batteries, or 27.6 to 29.0 volts for 20-cell nickel-cadmium batteries.

During the first few weeks of operation, the batteries should be checked periodically with a hydrometer. A high specific gravity, bubbling of electrolyte and loss of water indicate excessive float voltage. A drop in specific gravity indicates insufficient float voltage.

1. Connect the fully-charged battery (verify charge condition with the hydrometer).
2. Connect the voltmeter directly to the battery terminals.
3. Measure the battery voltage. If voltage is above the recommended float voltage, proceed to Step 4. If the voltage is below the recommended float voltage, proceed to Step 7.
4. Open right cabinet door of automatic transfer switch.
5. Insert a small screwdriver through the hole in the front panel of battery charger module 6. Turn counterclockwise in small increments to decrease the float voltage.
6. After five minutes, measure the battery terminal voltage again. If voltage is still high, repeat Steps 5 and 6 until voltage stabilizes at the recommended float voltage. Proceed to Step 11.
7. Open right cabinet door of automatic transfer switch.
8. Note charge current rate on charge ammeter on meter-lamp panel.
9. Insert a small screwdriver through hole in front panel of battery charger module 6. Turn clockwise in small increments to increase float voltage. Note increase in the charging current on the charge ammeter on the meter-lamp panel.
10. In approximately one hour or when charge current has decreased to initial value noted in Step 8, recheck battery terminal voltage. Repeat Steps 8 through 10 until the battery terminal voltage stabilizes at the recommended float voltage.
11. Check the battery with a hydrometer and check the battery terminal voltage periodically during the first few weeks of operation. Readjust the float charge rate if necessary.
12. Close the cabinet door.

AC VOLTAGE SENSORS

Voltage sensors perform either undervoltage or overvoltage sensing on line or generator power supplies. Range of the settings is from 90 to 140 volts for a nominal 120-volt system. For higher voltage systems, the knob ("PICK-UP VOLTAGE") readings are multiplied by the following multiplying factors.

VOLTAGE	MULTIPLYING FACTOR
120	1.0
208	1.73
240	2.0
480	4.0
600	5.0

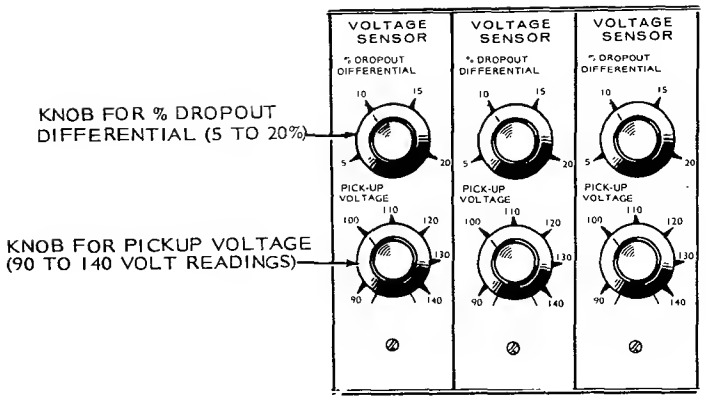


FIGURE 16. VOLTAGE SENSORS

If you wish to check the calibration of the sensors before making the settings, see *Undervoltage Sensor Calibration* or *Overvoltage Sensor Calibration,* whichever applies. Otherwise, see *Undervoltage Sensor Settings* or *Overvoltage Sensor Settings.* Refer to Figure 16.

Undervoltage Sensor Calibration

1. Open the right cabinet door of the automatic transfer switch.
2. Move the operation selector switch on engine control to "STOP."
3. Turn all the undervoltage sensor knobs to minimum voltage setting.
4. Turn the "PICK-UP VOLTAGE" knob of the sensor to be calibrated to its clockwise limit.
5. Turn the "PICK-UP VOLTAGE" knob very slowly counterclockwise until you hear relay K3 pick up. This reading times the multiplying factor (for your system voltage) should equal the line voltage. Check line voltage with a voltmeter, divide by the factor to see if the reading is correct. If it is, proceed to Step 7. If not, proceed to Step 6.
6. *Setting Two Low:* (a) Turn the "PICK-UP VOLTAGE" knob to its clockwise limit, then counterclockwise to desired setting. (b) Insert a small screwdriver through the "CALIBRATE" hole and turn counterclockwise very slowly until you hear relay K3 pick up.

   Setting Too High: (a) Turn the "PICK-UP VOLTAGE" knob to its clockwise limit. (b) Insert a small screwdriver through the "CALIBRATE" hole and turn to its clockwise limit. (c) Turn the "PICK-UP VOLTAGE" knob to desired setting. (d) Turn the "CALIBRATE" adjustment counterclockwise very slowly until you hear relay K3 pick up.
7. Repeat Steps 3 through 6 for each undervoltage sensor. If these calibrations are satisfactory for your application, make the sensor settings. See *Undervoltage Sensor Settings* (near end of section).

8. For a more accurate calibration and calibration of the "% DROP-OUT DIFFERENTIAL" knob, use the Onan Multi-Tester or a variac and use the following procedure.
9. Remove the twist-lock disconnect plug.
10. Open the control accessory panel.
11. Remove the plastic cover over the stepdown transformer terminals and remove the hot wire lead from the stepdown transformer's right side terminal of the terminal strip for the respective sensor. For example, if the nominal voltage is 208 volts, remove the wire lead from T2-3 for sensor 1. Do *not* remove the common (com) lead. See Figure 17.
12. If available, connect an Onan Multi-Tester to the transformer terminal strip and to the wire lead removed in Step 11 (using the instructions with the Multi-Tester). If using a variac, connect its common output lead to transformer T2-1 (com) and its other output lead to transformer terminal 2 (120-volt connection). See Figure 18.
13. Connect a voltmeter to the output leads of the variac.
14. Connect the variac input to a 120-volt AC source. Be absolutely sure the common from the transformer through the variac will be connected to the common of the line.

CAUTION **Common must connect to common of AC line. Otherwise, equipment damage can result.**

15. Reconnect the disconnect plug.

WARNING **Rear of control accessory panel is now energized and presents a serious shock hazard!**

16. Turn all the undervoltage sensor knobs to minimum.
17. Adjust the Multi-Tester or variac to give a 120-volt output for the undervoltage sensor module.
18. Turn the "PICK-UP VOLTAGE" knob on the sensor to be calibrated to its clockwise limit.
19. Turn the knob very slowly counterclockwise until you hear relay K3 pick up. The knob should indicate 120 volts. If not, proceed to Step 20. If it does read 120 volts, proceed to Step 21.
20. *Setting Too Low:* (a) Turn the "PICK-UP VOLTAGE" knob to its clockwise limit, then counterclockwise to desired setting. (b) Insert a small screwdriver through the "CALIBRATE" hole and turn counterclockwise very slowly until you hear relay K3 pick up.

    Setting Too High: (a) Turn the "PICK-UP VOLTAGE" knob to its clockwise limit. (b) Insert a small screwdriver through the "CALIBRATE" hole and turn to its clockwise limit. (c) Turn the "PICK-UP VOLTAGE" knob to desired setting. (d) Turn the "CALIBRATE" adjustment counterclockwise very slowly until you hear relay K3 pick up.

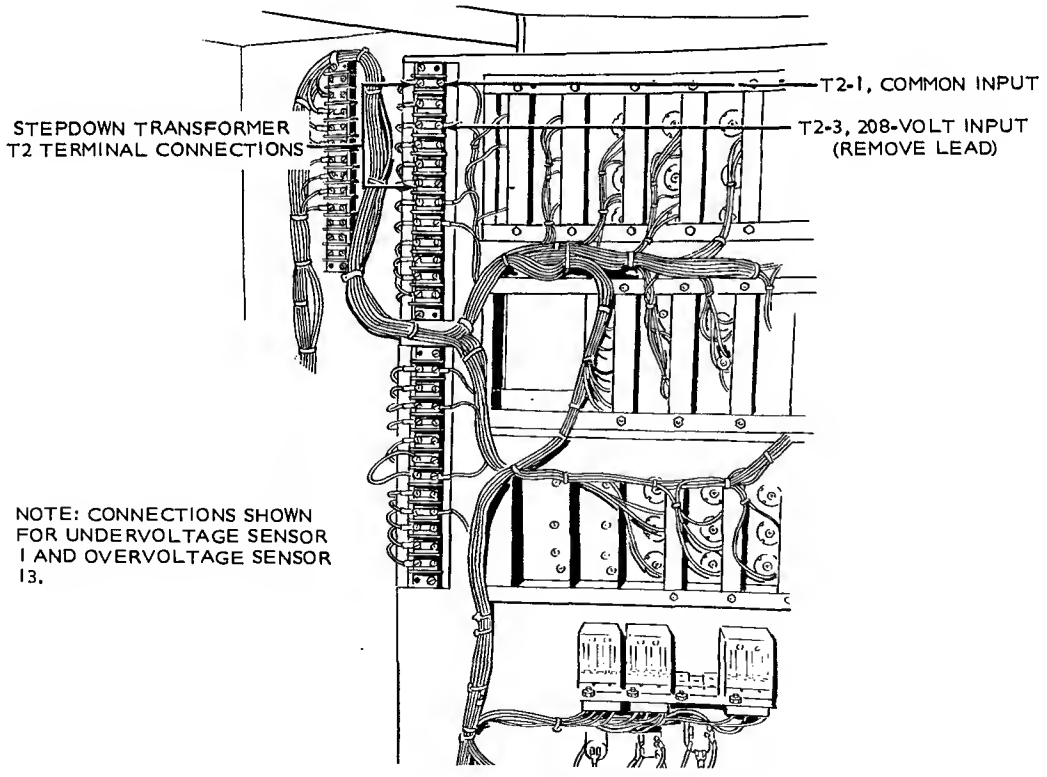


FIGURE 17. VOLTAGE SENSOR TRANSFORMER CONNECTIONS

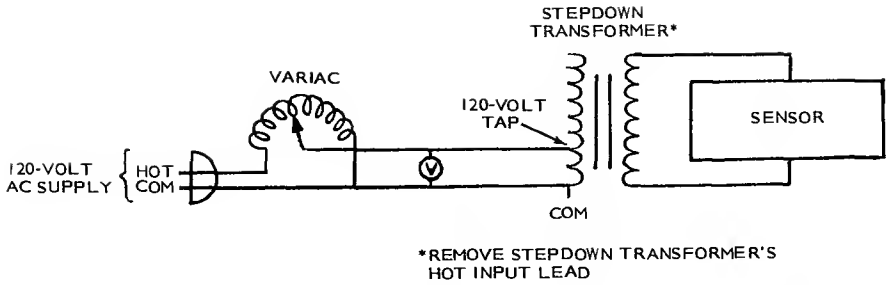


FIGURE 18. CONNECTION OF VARIAC TO STEPDOWN TRANSFORMER

21. With sensor module "PICK-UP VOLTAGE" knob at 120 volts and "% DROP-OUT DIFFERENTIAL" knob at maximum, lower the AC output voltage from the Multi-Tester or variac until the voltmeter reads 108 volts.
22. Turn "% DROP-OUT DIFFERENTIAL" knob counterclockwise until you hear relay K3 drop out. The knob should read approximately 10 (90 percent of 120 volts = 108 volts). If not, use a small screwdriver to loosen the knob and reposition so it indicates 10 percent.
23. Set the "PICK-UP VOLTAGE" and "% DROP-OUT DIFFERENTIAL" knobs at desired settings.
24. Decrease the voltage with the Multi-Tester or variac until you hear relay K3 drop out.
25. Increase the voltage with the Multi-Tester or variac until you hear relay K3 pick up.
26. Readjust the "PICK-UP VOLTAGE" and "% DROP-OUT DIFFERENTIAL" knobs to give the desired pickup and dropout voltages.
27. Rather than reconnecting the voltmeter, variac or Multi-Tester for the other undervoltage sensors, pull out the already calibrated module and replace it with one of the other undervoltage sensors. Then perform the calibration procedures in this position.
28. After calibration is complete, remove the disconnect plug.
29. Disconnect the Multi-Tester or variac and voltmeter.
30. Reconnect the wire lead removed in Step 11 and install the plastic cover over the terminals.
31. Close the control accessory panel and reconnect the disconnect plug.
32. Make the sensor settings. See *Undervoltage Sensor Settings* (near end of section).

Overvoltage Sensor Calibration

1. Open the cabinet door of the automatic transfer switch.
2. Move the operation selector switch on engine control to "STOP."
3. Turn the "% DROP-OUT DIFFERENTIAL" knobs to minimum and the "PICK-UP VOLTAGE" knobs to the clockwise limit (maximum).
4. On the sensor to be calibrated, turn "PICK-UP VOLTAGE" knob very slowly counterclockwise until you hear relay K6 close. This reading times the multiplying factor should equal the line voltage. Check line voltage with a voltmeter, divide by the factor to see if the reading is correct. If it is, proceed to Step 6. Otherwise, proceed to Step 5.
5. *Setting Too Low:* (a) Turn the "% DROP-OUT DIFFERENTIAL" knob counterclockwise to minimum. (b) Turn the "PICK-UP VOLTAGE" knob to the desired setting. (c) Insert a small screwdriver through the "CALIBRATE" hole and turn counterclockwise very slowly until you hear relay K6 pick up.

   Setting Too High: (a) Turn the "PICK-UP VOLTAGE" knob to its clockwise limit. (b) Insert a small screwdriver through the "CALIBRATE" hole and turn to its clockwise limit. (c) Turn the "PICK-UP VOLTAGE" knob to the desired setting. (d) Turn the "CALIBRATE" adjustment counterclockwise very slowly until you hear relay K6 pick up.
6. Repeat Steps 3 through 5 for each overvoltage sensor. If these calibrations are satisfactory for your application, make the sensor settings. See *Overvoltage Sensor Settings* (near end of section).
7. For a more accurate calibration and calibration of the "% DROP-OUT DIFFERENTIAL" knob, use the Onan Multi-Tester or a variac and use the following procedure.
8. Remove the twist-lock disconnect plug.
9. Open the control accessory panel.
10. Remove the plastic cover over the stepdown transformer terminals and remove the hot wire lead from the stepdown transformer's right side terminal of the terminal strip for the respective sensor. For example, if the nominal voltage is 208 volts, remove the wire lead from T2-3 for sensor 13. Do *not* remove the common (com) lead. See Figure 17.
11. If available, connect an Onan Multi-Tester to the transformer terminals of the terminal strip and the wire lead removed using the instructions in the

Multi-Tester. If using a variac, connect its common output lead to transformer T2-1 (com) and its other output lead to terminal 2 (120-volt connection). See Figure 18.

12. Connect a voltmeter to the output leads of the variac.
13. Connect the variac input to a 120-volt AC source. Be sure the common from the transformer will be connected to the common of the line.

CAUTION **Common must connect to common of AC line. Otherwise, equipment damage can result.**

14. Reconnect the disconnect plug.

WARNING **Rear of control accessory panel is now energized and presents a serious shock hazard!**

15. Turn the "% DROP-OUT DIFFERENTIAL" knob(s) to minimum and the "PICK-UP VOLTAGE" knob(s) to the clockwise limit (maximum).
16. Adjust the Multi-Tester or variac to give a 120-volt output for the overvoltage sensor module.
17. Turn the "PICK-UP VOLTAGE" knob on the sensor to be calibrated counterclockwise very slowly until you hear relay K6 close. The knob should indicate 120 volts. If not, proceed to Step 18. If it does, proceed to Step 19.
18. *Setting Too Low:* (a) Turn the "% DROP-OUT DIFFERENTIAL" knob counterclockwise to minimum. (b) Turn the "PICK-UP VOLTAGE" knob to the desired setting. (c) Insert a small screwdriver through the "CALIBRATE" hole and turn counterclockwise very slowly until you hear relay K6 pick up.

    Setting Too High: (a) Turn the "PICK-UP VOLTAGE" knob to its clockwise limit. (b) Insert a small screwdriver through the "CALIBRATE" hole and turn to its clockwise limit. (c) Turn the "PICK-UP VOLTAGE" knob to the desired setting. (d) Turn the "CALIBRATE" adjustment counterclockwise very slowly until you hear relay K6 pick up.
19. Turn the sensor module "PICK-UP VOLTAGE" knob to 132 volts, relay K6 should drop out. Increase the AC output voltage from the Multi-Tester or variac until relay K6 picks up at approximately 132 volts.
20. Decrease the Multi-Tester or variac output voltage to check "% "DROP-OUT DIFFERENTIAL." With the knob set at 5 percent, relay K6 should drop out at approximately 95 percent of 132 volts = 125 to 126 volts. If not, use a small screwdriver to loosen the knob and reposition so it indicates 5 percent with drop-out voltage of 125 to 126 volts.
21. Set the "PICK-UP VOLTAGE" and "% DROP-OUT DIFFERENTIAL" knobs at desired settings.
22. Increase the voltage with the Multi-Tester or variac until you hear relay K6 pick up.
23. Decrease the voltage with the Multi-Tester or variac until you hear relay K6 drop out.
24. Readjust the "PICK-UP VOLTAGE" and "% DROP-OUT DIFFERENTIAL" knobs to give the desired pick-up and drop-out voltages.
25. Rather than reconnecting the voltmeter, variac or Multi-Tester for the other overvoltage sensors (if more than one), pull out the already calibrated module and replace it with one of the other overvoltage sensors. Then perform the calibration procedures in this position.
26. After calibration is complete, remove the disconnect plug.
27. Disconnect the Multi-Tester or variac and voltmeter.
28. Reconnect the wire lead removed in Step 10 and install the plastic cover over the terminals.
29. Close the control accessory panel and reconnect the disconnect plug.
30. Make the sensor settings. See *Overvoltage Sensor Settings* (following).

Undervoltage Sensor Settings

1. Turn the "PICK-UP VOLTAGE" knob to the desired pick-up voltage (voltage at which load is transferred from generator set to commercial power). Unless you have special equipment which can be damaged by slight voltage changes, a setting which gives pickup at 90 percent of the nominal voltage is usually satisfactory. For example, 90 percent of 120 volts (for a 120-volt system) gives 108 volts for the knob setting.

   The drop-out differential is determined by the pick-up setting.

2. Turn the "% DROP-OUT DIFFERENTIAL" knob to the desired percent deviation below the pick-up voltage. This setting is the voltage at which the load is transferred from commercial power to the generator set. A setting of 15 percent is often satisfactory. For example, 15 percent of 108 volts (pick-up voltage from Step 1) is 16 volts. The dropout voltage is then pick-up voltage minus the differential voltage, 108 - 16 = 92 volts.
3. After settings are finished, move the operation selector switch on engine control to "RMT."
4. Close cabinet door.

Overvoltage Sensor Settings

1. Turn the "PICK-UP VOLTAGE" knob to the desired pick-up voltage (voltage at which load is transferred from commercial power to the generator set). Unless you have special equipment which can be damaged by slight voltage changes, a setting (13 percent) which gives pick-up at 113 percent of the nominal voltage is usually satisfactory. For example, 113 percent of 120 volts (for a 120 volt system) gives 135 volts for the knob setting.

   The drop-out differential is determined by the pick-up setting.

2. Turn the "% DROP-OUT DIFFERENTIAL" knob to the desired deviation below the pick-up voltage. This setting is the voltage at which the load is transferred from the generator set to commercial power. A setting of 5 percent is often satisfactory. For example, 5 percent of 135 volts (pick-up voltage from Step 1) is approximately 7 volts. The drop-out voltage is then pick-up voltage minus the differential voltage, 135 - 7 = 128 volts.
3. After settings are finished, move the operation selector switch on engine control to "RMT."
4. Close cabinet door.

TRANSFER SWITCH

The motor-operated transfer switches have been adjusted for proper operation before they leave the factory. Do not adjust position of any part since this can affect operation and reduce operation life of the transfer switch. However, the motor mechanism can be removed for inspection of the switch, motor cutoff switch, interlock contacts, and transfer switch motors. Use the following procedure.

1. Open the cabinet doors of the automatic transfer switch.
2. Move the operation selector switch on the engine control to "STOP."
3. Disconnect the ground cable of the starting batteries.
4. Remove AC line power from the automatic transfer switch.

WARNING **Never perform maintenance or service of the transfer switch unless all power is removed from the automatic transfer switch and the generator set is disabled. Otherwise, the automatic transfer switch presents a serious shock hazard.**

5. Move the motor disconnect switch S8 to "OFF."
6. Remove the manual operator handle from its stored position.
7. Push handle on drive shaft (on side transfer switch indicates "ON").
8. Turn handle clockwise to open the transfer switch contacts (position indicator should now read "OFF"). See Figure 19.

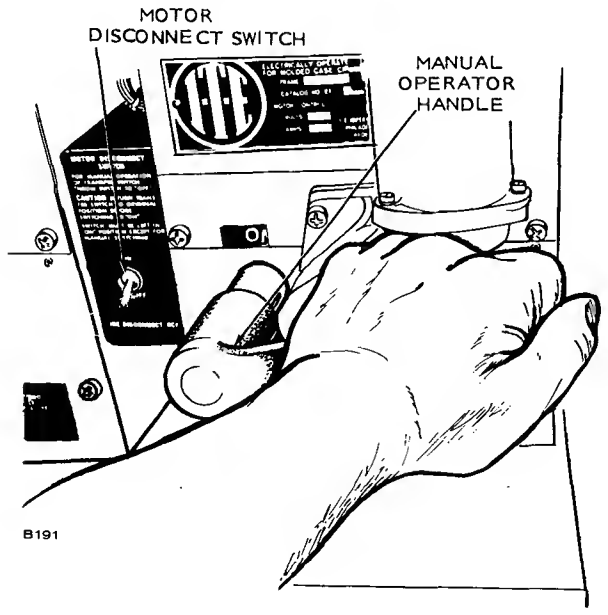


FIGURE 19. MANUAL OPERATION OF TRANSFER SWITCH

The transfer switch is mechanically-interlocked.

9. Loosen the two top Phillip screws which hold the cover with the ITE nameplate. Slide cover up and off the transfer switch (Figure 20) to expose terminal block.

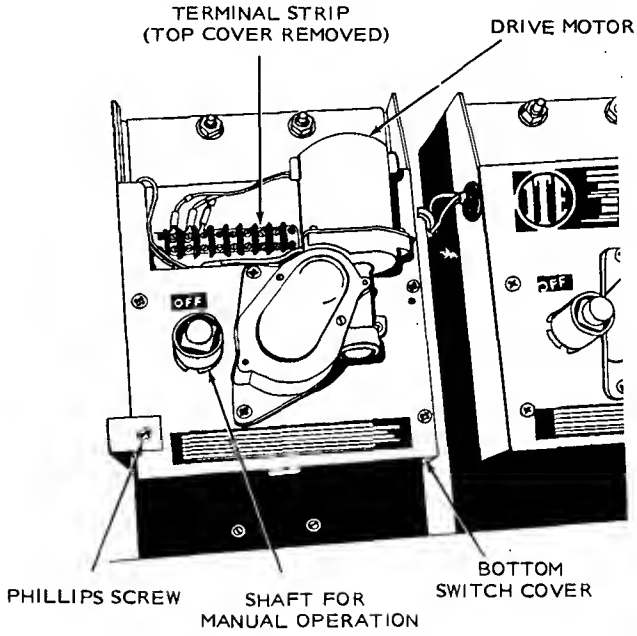


FIGURE 20. TRANSFER SWITCH WITH NAMEPLATE COVER REMOVED

10. Remove the top wires only from the terminal block (note positions for reconnection) and push the wires out through the grommet on the side of transfer switch.

If you want to remove the drive motor with drive gear and shaft as an assembly from the transfer switch, proceed to Step 16. Otherwise, proceed to Step 11.

11. Remove the three motor leads from the terminal block.
12. Remove the three Phillip screws while holding the motor and drive assembly. Pull assembly straight back and out (Figure 20).
13. Remove the bottom two Phillips screws and slide the bottom cover (with description of manual operation) off the transfer switch.
14. Remove remaining wire leads to terminal block from motor cutoff switch (note positions).

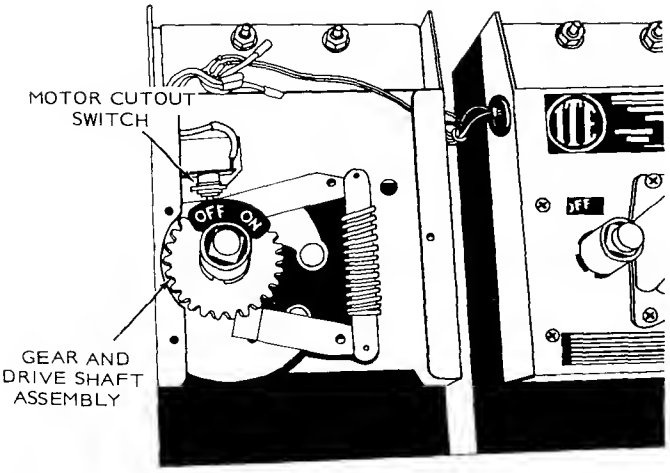


FIGURE 21. GEAR AND DRIVE ASSEMBLY OF TRANSFER SWITCH

15. Remove the Phillip screws previously loosened, grab hold of the small panel, gear and drive shaft assembly, and pull straight out (Figure 21).

The motor cutoff switch is now exposed.

16. Remove the two nuts with an 11/16-inch wrench and remove the motor assembly or sheet metal panel over the transfer switch (Figure 22).
17. Remove the four screws from the plastic transfer switch cover and pull off cover. The interlock switches, auxiliary contact switches, transfer switch handle and switch interior are now exposed.

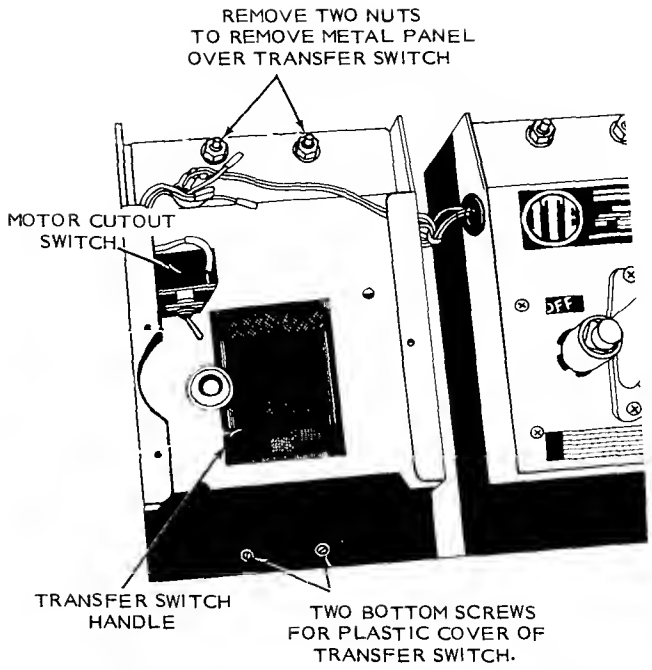


FIGURE 22. TRANSFER SWITCH WITH GEAR AND DRIVE ASSEMBLY REMOVED

18. Each interlock and auxiliary contact assembly is held in place by two screws and nuts. If removed, note wire connections.
19. Reassemble in the reverse order. Be sure motor disconnect switch is in original position when installing gear and shaft assembly.

TROUBLESHOOTING

This troubleshooting section is divided into two main parts, one for automatic transfer switches with control accessory panels in groups 01 through 05 (relay-type panels), and those with control accessory panels in groups 11 through 15 (modular-type panels). Groups 01 through 05 are covered first with groups 11 through 15 starting on page 48.

AT'S WITH CONTROL PANEL GROUPS 01 THROUGH 05

To correct the problem, answer the question in the appropriate troubleshooting chart either "YES" or "NO," then refer to the number in the column and proceed to that step. Below is an index of problems.

INDEX

A.	Automatic transfer switch fails to immediately connect load to line when generator set is not operating.	YES	NO
1A.	Is normal line energized and delivering rated voltage to the line terminals of the transfer switch?	2A	—
2A.	Is control panel disconnect plug P1 properly inserted into receptacle?	3A	—
3A.	Is motor disconnect switch S8 closed to connected rated voltage to transfer switch motors?	4A	—
4A.	Does AT have a retransfer time delay K10?	5A	7A
5A.	Does transfer switch operate if K4 terminal 5 is jumpered to terminal 6?	6A	7A
6A	Replace interposing generator relay K4.	—	—
7A.	Is automatic transfer switch a 3-phase AT?	8A	10A
8A.	Is rated AC voltage present between terminals K10-8 and K10-6?	10A	9A
9A.	Replace phase protection relay K6.	—	—
10A.	Are relay contacts K3 (5-6) closed on rear of control accessory panel and making good contact (disconnect plug must be connected to receptacle)?	12A	11A
11A.	Replace interposing line relay K3.	—	—
12A.	Are relay contacts K8 (3-4) and K8 (1-2) closed and making good contact?	15A	13A
13A.	Clean contacts K8 (3-4) and K8 (1-2). Does this correct problem?	—	14A
14A.	Replace instant transfer to line relay K8.	—	—
15A.	Is generator side transfer switch in "OFF" position (see indicator on transfer switch)?	21A	16A
16A.	Is rated AC voltage (nominal 220V with 480 or 600V system) present between terminals TB16-2 and TB16-3?	17A	18A
17A.	Is rated AC voltage (nominal 220V with 480 or 600V system) present between terminals TB16-3 and TB16-5?	20A	19A
18A.	Replace MB1 interlock contact assembly.	—	—
19A.	Replace GCO cutoff switch assembly.	—	—
20A.	Repair or replace transfer switch motor G.	—	—
21A.	Does automatic transfer switch have an auxiliary transfer and retransfer time delay assembly (located in transfer switch control box)?	22A	24A
22A.	Does transfer switch operate if terminal TB11-1 is jumpered to TB11-2?	23A	24A
23A	Repair or replace time delay K11.	—	—

A.	(continued)	YES	NO
24A.	Is rated AC voltage (nominal 220V with 480 or 600V system) present between terminals TB15-1 and TB15-3?	25A	26A
25A	Is rated AC voltage (nominal 220V with 480 or 600V system) present between terminals TB15-3 and TB15-4?	28A	27A
26A	Replace GB1 interlock contact assembly.	—	—
27A.	Replace MCO cutoff switch assembly.	—	—
28A.	Repair or replace transfer switch motor M.	—	—

B.	Automatic transfer switch fails to connect load to generator set when set runs during test with load or during a normal power outage.	YES	NO
1B.	Is generator output near rated voltage?	2B	—
2B.	Is motor disconnect switch S8 closed to connect rated AC voltage (nominal 220V with 480 or 600V system) to transfer switch motors?	3B	—
3B.	Is line-side transfer switch in "OFF" position (see indicator on transfer switch)?	14B	4B
4B.	Is rated AC voltage present between terminals TB6-7 and TB6-8?	9B	5B
5B.	Does AT have a transfer time delay K13?	6B	9B
6B.	Is time delay completed?	7B	—
7B.	Does transfer switch operate if terminal K13-1 on rear of control accessory panel is jumpered to K13-5 (for 480/600-volt system, jumper K13-1 to K13-2)?	8B	9B
8B.	Repair or replace transfer time delay K13.	—	—
9B.	Does automatic transfer switch have an auxiliary transfer and retransfer time delay assembly (located in transfer switch control box)?	10B	12B
10B.	Does transfer switch operate if terminal TB11-5 is jumpered to TB11-6?	11B	12B
11B.	Repair or replace time delay K12.	—	—
12B.	Is relay K4 energized and are contacts K4 (3-4) closed properly?	14B	13B
13B.	Replace interposing generator relay K4.	—	—
14B.	Are contacts K3 (1-3) (contacts 5 and 6 for 480/600-volt system) closed to bring rated AC voltage to TB6-8? Measure for rated AC voltage between TB6-7 and TB6-8.	16B	15B
15B.	Replace interposing line relay K3.	—	—
16B.	Does transfer switch operate when terminal K8-5 is jumpered to K8-6?	18B	17B
17B.	Does transfer switch operate when terminal K8-7 is jumpered to K8-8?	18B	20B

B. (continued)	YES	NO
18B. Clean K8 contacts. Does this correct problem?	—	19B
19B. Replace instant transfer to line relay K8.	—	—
20B. Is line-side transfer switch in "OFF" position (see indicator on transfer switch)?	26B	21B
21B. Is rated AC voltage (nominal 220V with 480 or 600V system) present between TB15-2 and TB15-3?	22B	23B
22B. Is rated AC voltage (nominal 220V with 480 or 600V system) present between TB15-3 and TB15-5?	25B	24B
23B. Replace GB2 interlock contact assembly.	—	—
24B. Replace MCO cutoff switch assembly.	—	—
25B. Repair or replace transfer switch motor M.	—	—
26B. Is rated AC voltage (nominal 220V with 480 or 600V system) present between TB16-1 and TB16-3?	27B	28B
27B. Is rated AC voltage (nominal 220V with 480 or 600V system) present between TB16-3 and TB16-4?	30B	29B
28B. Replace MB2 interlock contact assembly.	—	—
29B. Replace GCO cutoff switch assembly.	—	—
30B. Repair or replace transfer switch motor G.	—	—

C. Automatic transfer switch fails to start generator set during a power outage.	YES	NO
1C. Perform generator set test by placing automatic transfer switch selector switch S2 to "TEST." Does generator set start?	6C	2C
2C. Is selector switch on engine control in the "REMOTE" position?	3C	—
3C. Does generator set start, run, and stop with switch located on generator set? Return switch to remote position.	4C	—
4C. Jumper TB1-B+ to TB1-RMT. Check to ensure that voltage from GND to TB1-RMT is equal to battery rated voltage. Does engine crank?	5C	—
5C. Check circuit from TB1-B+ through AT switch S2(1-2) to TB1-RMT for loose connections or open circuits.	—	—
6C. Does AT have a start time delay relay K7?	7C	8C
7C. Has time delay K7 completed its delay?	8C	—
8C Does generator set start if terminal K7-1 is jumpered to K7-5?	9C	—
9C. Replace relay K7.	—	—

D.	Automatic transfer switch fails to automatically retransfer load from generator set to line after normal power returns. Generator set continues to run.	YES	NO
1D.	Is control panel disconnect plug inserted completely into receptacle?	2D	—
2D.	Is test transfer switch S1 in closed ("NORMAL") position?	3D	—
3D.	Is motor disconnect switch S8 closed?	4D	—
4D.	Is rated AC voltage present at transfer switch line terminals?	5D	—
5D.	Does automatic transfer switch have area protection equipment connected to terminals TB1-4 and TB1-5?	6D	8D
6D.	Jumper terminals TB1-4 to TB1-5. Does automatic transfer switch retransfer load to line (at end of retransfer time delay if used)?	7D	8D
7D.	Check area protection equipment for malfunction.	—	—
8D.	Is automatic transfer switch a 3-phase AT?	9D	11D
9D.	Is rated AC voltage (nominal 220V with 480 or 600V system) present between terminals K10-6 and K10-8?	11D	10D
10D.	Replace phase protection relay K6.	—	—
11D.	Does AT have a retransfer time delay relay K10?	12D	10A
12D.	Has motor timer completed time delay period? Time delay expired if AC voltage is present between terminals K10-6 and K10-7.	10A	13D
13D.	Replace motor timer if it is stalled (does not time out).	—	—

E.	Automatic transfer switch delays transferring load to line until generator set stops after a power outage.	YES	NO
1E.	Does AT have a retransfer time delay K10?	2E	5E
2E.	Has time delay completed delay period? Time delay expired if AC voltage present between terminals K10-6 and K10-7 (with generator set running — K4 energized).	3E	—
3E.	Does transfer switch retransfer load to line if terminal K10-8 is jumpered to K10-7?	4E	5E
4E.	Repair or replace retransfer time delay K10.	—	—
5E.	Do relay contacts K3(5-6) close when the normal source voltage returns?	6E	7E
6E.	Clean contacts K3 (5-6). Does this correct problem?	—	7E
7E.	Replace relay K3.	—	—

F.	Generator set starts during normal power service.	YES	NO
1F.	Is operation selector switch S1 positioned at "NORMAL?"	2F	—
2F.	Is control panel disconnect plug inserted completely into receptacle?	3F	—
3F.	Does automatic transfer switch have an exerciser clock?	4F	5F
4F.	Is exerciser clock turned to exercise period?	—	5F
5F.	Is rated AC voltage present at transfer switch line terminals?	6F	—
6F.	Is automatic transfer switch a 3-phase AT?	7F	9F
7F.	Is phase protection relay K6 energized and are contacts K6(5-6) closed and making good contact?	9F	8F
8F.	Replace phase protection relay K6.	—	—
9F.	Does AT have a start time delay K7.	10F	11F
10F.	Measure for rated AC voltage (nominal 220V with 480 or 600V system) from terminal K7-L1 to K7-L2. If present, repair or replace start time delay relay K7.	—	—
11F.	Is start-stop relay K7 energized and are contacts K7(1-5) open?	—	12F
12F.	Replace start-stop relay K7.	—	—

G.	Exerciser clock does not start generator set.	YES	NO
1G.	Does exerciser motor timer M1 operate?	2G	5G
2G.	Is operation selector switch S2 at "NORMAL?"	3G	—
3G.	Has overcrank condition occurred?	—	4G
4G.	Do contacts M1(3-5) close to put battery voltage on TB1-RMT terminal during exercise period? See instructions for exercise clock adjustments.	—	6G
5G.	Replace the exerciser clock.	—	—
6G.	Replace the microswitch on the exerciser clock or replace exerciser clock.	—	—

AT'S WITH CONTROL ACCESSORY PANELS 11 THROUGH 15

To correct the problem, answer the question in the appropriate troubleshooting chart either "YES" or "NO," then refer to the number in the column and proceed to that step. Below is an index of problems.

INDEX

A.	Automatic transfer switch fails to immediately connect load to line when generator set is not operating.	YES	NO
1A.	Is normal line energized and delivering rated voltage to the line terminals of the transfer switch?	2A	—
2.A	Does automatic transfer switch have "NORMAL" and "EMERGENCY" indicating lamps?	3A	4A
3A.	Is the green "NORMAL" lamp lit?	5A	6A
4A.	Is control panel disconnect plug P1 properly inserted into receptacle?	5A	—
5A.	Is motor disconnect switch S8 closed to connect rated voltage to transfer switch motors?	6A	—
6A.	Are relay contacts K4 (3-9) on rear of control accessory panel closed and making good contact?	8A	7A
7A.	Replace generator interposing relay K4.	—	—
8A.	Are relay contacts K8(3-4) and K8(1-2) closed and making good contact?	11A	9A
9A.	Clean contacts K8(3-4) and K8(1-2). Does this correct problem?	—	10A
10A.	Replace instant transfer to line relay K8.	—	—
11A.	Is generator side transfer switch in "OFF" position (see indicator on transfer switch)?	17A	12A
12A.	Is rated AC voltage (nominal 220V with 480 or 600V system) present between terminals TB16-2 and TB16-3?	13A	14A
13A.	Is rated AC voltage (nominal 220V with 480 or 600V system) present between terminals TB16-3 and TB16-5?	16A	15A
14A.	Replace MB1 interlock contact assembly.	—	—
15A.	Replace GCO cutoff switch assembly.	—	—
16A.	Repair or replace transfer switch motor G.	—	—
17A.	Does automatic transfer switch have an auxiliary transfer and retransfer time delay assembly (located in transfer switch control box)?	18A	20A
18A.	Does transfer switch operate if terminal TB11-1 is jumpered to TB11-2?	19A	20A
19A.	Repair or replace time delay K11.	—	—
20A.	Is rated AC voltage (nominal 220V with 480 or 600V system) present between terminals TB15-1 and TB15-3?	21A	22A
21A	Is rated AC voltage (nominal 220V with 480 or 600V system) present between terminals TB15-3 and TB15-4?	24A	23A
22A.	Replace GB1 interlock contact assembly.	—	—
23A.	Replace MCO cutoff switch assembly.	—	—
24A.	Repair or replace transfer switch motor M.	—	—

B.	Automatic transfer switch fails to connect load to generator set when set runs during test with load or during a normal power outage.	YES	NO
1B.	Is generator output near rated voltage?	2B	—
2B.	Is motor disconnect switch S8 closed to connect rated AC voltage (nominal 220V with 480 or 600V system) to transfer switch motors?	3B	—
3B.	Is line-side transfer switch in "OFF" position (see indicator on transfer switch)?	14B	4B
4B.	Does automatic transfer switch have "NORMAL" and "EMERGENCY" indicating lamps?	5B	6B
5B.	Is "EMERGENCY" lamp lit?	28B	6B
6B.	Is rated AC voltage (nominal 220V with 480 or 600V system) present between terminals TB7-7 and TB7-8?	28B	7B
7B.	Does transfer switch operate when voltage sensor module 4 pick-up voltage knob is turned to minimum (counterclockwise)?	8B	9B
8B.	Is input voltage to transformer T3 connected to correct primary tap to give nominal 40 volts AC on T3 (X1-X2)?	9B	—
9B.	Does transfer switch operate when voltage sensor module 4 is replaced by bypass plug or if K4 terminal A is jumpered to ground?	10B	11B
10B.	Replace voltage sensor module 4.	—	—
11B.	Is plug-in module 8 a transfer time delay (300-0924)?	12B	14B
12B.	Does transfer switch operate when transfer time delay module 8 is replaced by a bypass plug or if K4 terminal B is jumpered to J5-16?	13B	14B
13B.	Replace transfer time delay module 8.	—	—
14B.	Does automatic transfer switch have an auxiliary transfer and retransfer time delay assembly (located in transfer switch control box)?	15B	17B
15B.	Does transfer switch operate if terminal TB11-5 is jumpered to TB11-6?	16B	17B
16B.	Repair or replace time delay K12.	—	—
17B.	Is voltage on K4 (A-B) above 9 volts DC?	23B	18B
18B.	Is voltage from TB1-GND to TB1-B+ equal to rated battery voltage?	19B	43B
19B.	Is voltage from TB3-7 to TB3-16 equal to rated battery voltage?	20B	43B
20B.	Is voltage from TB3-7 to TB1-6 greater than 9 volts DC?	21B	44B
21B.	Is voltage from TB3-7 to TB1-7 greater than 9 volts DC?	22B	45B
22B.	Is voltage from TB3-7 to K4-B greater than 9 volts DC?	23B	46B
23B.	Is relay K4 energized and are contacts K4 (4-7) closed properly?	25B	24B
24B.	Replace relay K4.	—	—
25B.	Is rated AC voltage present on transfer switch generator terminals?	26B	—

B. (continued)		YES	NO
26B.	Are contacts K3 (8-2) closed to bring rated AC voltage down to TB6-8? Measure for rated AC voltage between TB6-7 and TB6-8?	28B	27B
27B.	Replace relay K3.	—	—
28B.	Does transfer switch operate when terminal K8-5 is jumpered to K8-6?	30B	29B
29B.	Does transfer switch operate when terminal K8-7 is jumpered to K8-8?	30B	32B
30B.	Clean K8 contacts. Does this correct problem?	—	31B
31B.	Replace instant transfer to line relay K8.	—	—
32B.	Is line-side transfer switch in "OFF" position (see indicator on transfer switch)?	38B	33B
33B.	Is rated AC voltage (nominal 220V with 480 or 600V system) present between TB15-2 and TB15-3?	34B	35B
34B.	Is rated AC voltage (nominal 220V with 480 or 600V system) present between TB15-3 and TB15-5?	37B	36B
35B.	Replace GB2 interlock contact assembly.	—	—
36B.	Replace MCO cutoff switch assembly.	—	—
37B.	Repair or replace transfer switch motor M.	—	—
38B.	Is rated AC voltage (nominal 220V with 480 or 600V system) present between TB16-1 and TB16-3?	39B	40B
39B.	Is rated AC voltage (nominal 220V with 480 or 600V system) present between TB16-3 and TB16-4?	42B	41B
40B.	Replace MB2 interlock contact assembly.	—	—
41B.	Replace GCO cutoff switch assembly.	—	—
42B.	Repair or replace transfer switch motor G.	—	—
43B.	Check for poor connection, defective battery, etc.	—	—
44B.	Replace module 5.	—	—
45B.	Check circuit from TB1-6 to TB1-7. It must be closed by a jumper or external circuit.	—	—
46B.	Replace module 8 with bypass plug. Make sure circuit from J8-22 to J8-12 is closed.	—	—

C.	Automatic transfer switch fails to start generator set during a power outage.	YES	NO
1C.	Perform generator set test by placing automatic transfer switch S2 in "WITHOUT LOAD" position and switch S1 in "TEST" position. Does generator set start?	6C	2C
2C.	Is selector switch on engine control in the "REMOTE" position?	3C	—
3C.	Does generator set start, run and stop with switch located on the generator set? Return switch to remote position.	4C	—
4C.	Jumper TB1-B+ to TB1-RMT. Check to ensure that voltage from GND to TB1-RMT is equal to rated battery voltage. Does engine crank?	5C	—
5C.	Check circuit from TB1-B+ through AT switch S1 (2-1), switch S2 (2-3) to TB1-RMT for loose connection or open circuits.	—	—
6C.	Is module 7 a start-stop time delay module?	7C	9C
7C.	Replace start-stop time delay module 7 with a bypass module 300-1177. Does generator set start?	8C	9C
8C.	Replace start-stop time delay module.	—	—
9C.	Jumper TB1-B+ and J7-9. Does generator set start after time delay?	10C	—
10C.	Replace interposing line relay K3.	—	—

D.	Automatic transfer switch fails to automatically retransfer load from generator set to line after normal power returns. Generator set continues to run.	YES	NO
1D.	Check battery charging fuse F1. Is fuse OK?	2D	—
2D.	Is motor disconnect switch S8 closed?	3D	—
3D.	Is rated AC voltage present at transfer switch line terminals?	4D	—
4D.	Is module 11 a retransfer time delay? **If it is and the time has been returned to zero for tests, etc., make sure the timer does not go back beyond zero. Otherwise, the generator set will not retransfer the load.**	5D	8D
5D.	Is "POWER ON" lamp lit in motor timer module 11?	6D	8D
6D.	Has the motor timer completed its time delay period?	25D	7D
7D.	Replace motor timer if it is stalled (it does not time out).	—	—
8D.	Does control accessory panel have a manual-automatic selector switch S3 and a push to retransfer switch S4?	9D	10D
9D.	Place manual-automatic selector switch S3 in "AUTO" position. Does automatic transfer switch retransfer load to line (at end of time delay if used)?	—	10D

D. (continued)		YES	NO
10D.	Record the pick-up voltage dial settings with small pencil marks on voltage sensor modules 1, 2 and 3 (only one on single-phase automatic transfer switch). Turn pick-up voltage knobs to 90 or below. Does motor timer "POWER ON" lamp light (if retransfer time delay used)? Does automatic transfer switch retransfer load to line?	11D	12D
11D.	Recheck the normal line voltage and output voltage of transformers T2, T4 and T5 for lower than normal readings. Make sure voltage sensors are set for correct pickup voltages.	—	—
12D.	Does control accessory panel have a manual-automatic selector switch S3 and push to retransfer switch S4?	13D	20D
13D.	Remove voltage sensor modules 1, 2 and 3 and replace with 300-0927 bypass modules or jumper TB3-5 to K5-A. Do K3 and K5 pick up when S4 is pushed with S3 in automatic position to light the motor timer "POWER ON" lamp (if equipped with retransfer time delay)? Does automatic transfer switch retransfer load to line (after retransfer time delay if equipped)?	14D	15D
14D.	*Three-Phase:* Isolate malfunctioning voltage sensor by plugging each individually into position 3 with bypass plugs in positions 1 and 2. Then replace voltage sensor module. Does transfer switch retransfer load to line?	11D	—
	Single-Phase: Replace voltage sensor in position 1. Does transfer switch retransfer load to line?	11D	—
15D.	Is voltage of K5 (A-B) at 9 volts DC or higher with switch S4 closed or S3 in "AUTO" position?	16D	17D
16D.	If voltage is present on coil K5 (A-B) but relay does not pick up, coil is probably open and must be replaced.	—	—
17D.	Is voltage TB3-5 to K5-A less than 2 volts DC when S4 is pushed or S3 is in "AUTO" position?	18D	24D
18D.	Is voltage from TB3-5 to S4-1 approximately 12 VDC when S4 is pushed or S3 is in "AUTO" position?	OK	19D
19D.	Is voltage from TB3-5 to S4-2 approximately 12 VDC?	OK	20D
20D.	Is voltage from TB3-5 to TB3-11 approximately 12 VDC?	OK	21D
21D.	Is voltage from TB3-5 to S2-5 equal to battery voltage?	22D	23D
22D.	Replace plug-in module 5.	—	—
23D.	Check wiring from B+ terminal to this point for open circuit.	—	—
24D.	Check all wiring and connections between these two points for open circuit or poor connection. Jumper these two points to check relay K5 operation with switch S3 in automatic position.	—	—
25D.	Did relay K3 pick up at end of time delay to close K3 (6-9)?	2A	26D
26D.	Measure K3 (A-B) voltage. If it is 9 volts or greater, coil probably is open. Replace relay.	—	—

E.	Automatic transfer switch delays transferring load to line until generator set stops after normal power outage.	YES	NO
1E.	Do relay contacts K3 (6-9) close as K3 relay picks up when the normal source voltage returns?	2E	3E
2E.	Clean contacts K3 (6-9). Does this correct problem?	—	3E
3E.	Replace relay K3.	—	—

F.	Generator set starts during normal service.	YES	NO
1F.	Is control panel disconnect plug properly inserted into receptacle?	2F	—
2F.	Does automatic transfer switch have an exerciser clock?	3F	4F
3F.	Is exerciser clock turned to the exercise period?	—	4F
4F.	Record pick-up voltage dial settings with small pencil marks on voltage sensor modules 1, 2 and 3 (one for control accessory group 15 and single-phase AT). Turn pick-up voltage knobs to 90 or below. Does generator set stop (after time delay)? After test, return knobs to original settings.	5F	6F
5F.	Recheck the normal line voltage and output voltage of transformers T2, T4 and T5 for lower than normal readings. Make sure voltage sensors are set for correct pick-up voltage.	—	—
6F.	Are modules 13, 14 and 15 overvoltage sensors (only one for single-phase automatic transfer switch)?	7F	10F
7F.	Record pick-up voltage dial settings with small pencil mark on voltage sensor modules. Turn pick-up voltage knobs to 140 volts. Does generator set stop (after time delay)? After test, return knobs to original settings.	8F	9F
8F.	Recheck the normal line voltage and output voltage of transformers T2, T4 and T5 for higher than normal readings. Make sure voltage sensors are set for correct pick-up voltage.	—	—
9F.	Is relay contact K6 (1-7) closed and making good contact?	10F	—
10F.	Is relay K3 energized, contacts K3 (1-7) open and contacts K3 (9-6) closed properly?	12F	11F
11F.	Measure K3 (A-B) voltage. If it is 9 volts or more, the relay coil probably is open. Replace relay.	—	—
12F.	Remove start-stop time delay module 7 and replace with the bypass plug module. Does generator set stop?	13F	—
13F.	Replace start-stop time delay module?	—	—

G. Exerciser clock fails to start generator set.	YES	NO
1G. Does exerciser motor timer M1 operate? Voltage on M1 (1-2) should be approximately 120 VAC.	2G	5G
2G. Has overcrank condition occurred (note overcrank lamp on AT-E models)?	—	3G
3G. Do contacts M1 (4-5) open and contacts M1 (3-5) close to put battery voltage on TB1-RMT terminal during exercise period? See instructions for exercise clock adjustments.	1C	4G
4G. Replace the microswitch on the exerciser clock or replace exerciser clock.	—	—
5G. Is one-ampere fuse F1 in control panel "blown"?	6G	—
6G. Replace fuse F1.	—	—

H. Battery charger malfunctions.	YES	NO
1H. Does battery charger fail to charge? Charge ammeter shows zero current and battery discharges?	6H	2H
2H. Does battery charger charge at high rate and cause battery to lose electrolyte (look for bubbling)?	4H	3H
3H. Does charger supply current but battery fails to supply sufficient cranking power?	5H	—
4H. Lower charger float voltage a small amount. Measure specific gravity once a week and readjust float voltage until charger will hold recommended specific gravity without overcharging. Increase float voltage again if specific gravity drops below recommended value.	—	—
5H. Check battery under load to see if it might have a dead cell. Check specific gravity of battery electrolyte and increase float voltage a small amount (check specific gravity once per week and reset float voltage until charger will hold recommended specific gravity).	—	—
6H. Check fuse F1. Is fuse OK?	7H	—
7H. Does primary of transformer T1 have rated input on correct terminals to produce approximately 20 volts AC on T1 (X1-X2) or approximately 40 volts on T1 (X1-X3)?	8H	—
8H. Remove module 6 and measure AC voltage at J6 (15-21). Is this approximately 20 volts for AT-D and 40 volts for AT-C?	9H	—
9H. Replace battery charger module 6 with new module.	—	—

USE OF BYPASS PLUG OR EXTENSION BOARD MODULE

A bypass module plug can bypass the operation of the voltage sensors, start-stop time delay, transfer time delay or retransfer time delay. The extension board module extends the voltage sensor or time delay out from the control accessory panel to expose printed circuit components for troubleshooting, testing, etc. Follow these instructions for the particular module.

Extension Board Module

1. Open right cabinet door of automatic transfer switch.
2. Position the operation selector switch on engine control at "STOP."
3. Remove the twist-lock disconnect plug.
4. Open the control accessory panel.
5. Remove the plug-in module.
6. Note position and remove keying plug(s) from the printed circuit board receptacle by sliding the plug(s) to the right.
7. Insert extension board module into receptacle.
8. Insert module removed in Step 5 into the back of the extension module (Figure 23).
9. Close control accessory panel and connect disconnect plug.

WARNING **Module extended from extension board module is now energized!**

10. Perform module adjustments or tests using appropriate instructions.
11. When the tests, etc. are completed, remove twist-lock disconnect plug and open control accessory panel.
12. Remove both modules from the control accessory panel.
13. Reinsert keying plug(s) removed in Step 6, into printed circuit board receptacle.
14. Plug in module removed in Step 5 or install new module, if required, into control accessory panel.
15. Close control accessory panel and connect disconnect plug.
16. Move the operation selector switch on engine control to "RMT."
17. Close cabinet door.

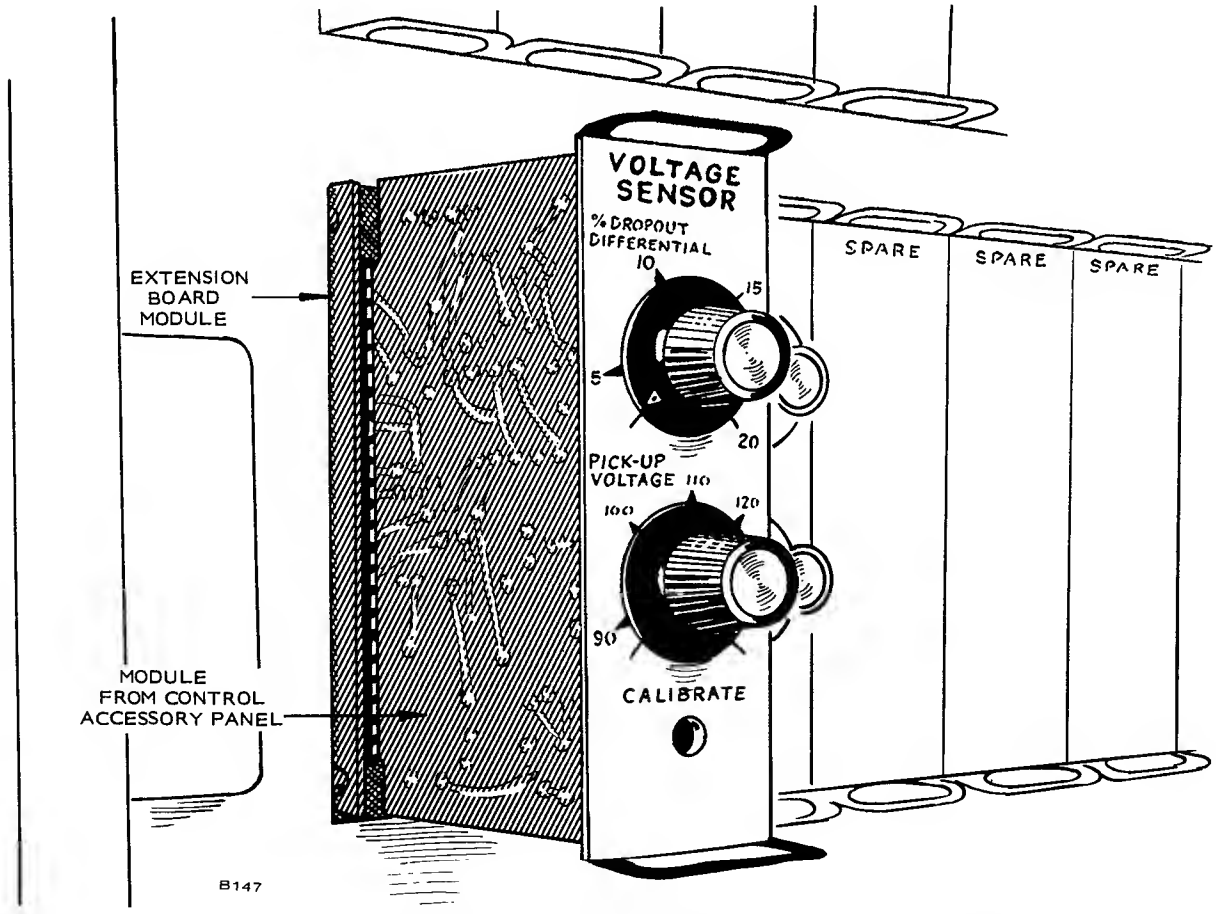


FIGURE 23. EXTENSION BOARD MODULE IN CONTROL ACCESSORY PANEL

Bypass Plug Module 300-0927

Do not use bypass plug module 300-0927 to bypass start-stop time delay module 7 because it won't operate the automatic transfer switch. For the start-stop delay position 7, use the start-stop bypass plug module 300-1177.

1. Open right cabinet door of automatic transfer switch.
2. Position the operation selector switch on engine control at "STOP."
3. Remove the twist-lock disconnect plug.
4. Open the control accessory panel.
5. Remove the module to be bypassed.
6. Slide the keying plug(s) to the right and pull out from the printed circuit board receptacle. Note position of the keying plug(s) when removing.
7. Close the control accessory panel.
8. Set switches S1 and S2 on the bypass module to the correct position (instructions on bypass module printed circuit board) for the particular bypass and insert the module. See Figure 24.
9. Connect the disconnect plug, reposition the operation selector switch and check operation of the automatic transfer switch.

   If the 1/4 ampere fuse on the bypass plug burns out, check and correct switch positions, then replace the fuse before inserting the bypass module again.

10. Move the operation selector switch to "STOP" after test is finished.
11. Remove disconnect plug and open control accessory panel.
12. Take out bypass plug module and reinstall keying plug(s) removed in Step 6.
13. Reinstall module from Step 5 or install new module, if required.
14. Close control accessory panel and connect the disconnect plug.
15. Move the operation selector switch on engine control to "RMT."
16. Close cabinet door.

Start-Stop Bypass Plug Module 300-1177

Use this bypass module in place of the start-stop time delay module (position 7 of control accessory panel). It's unnecessary to remove the keying plugs when using this bypass plug module.

1. Open cabinet door of automatic transfer switch.
2. Position the operation selector switch on engine control at "STOP."
3. Remove start-stop time delay module 7.

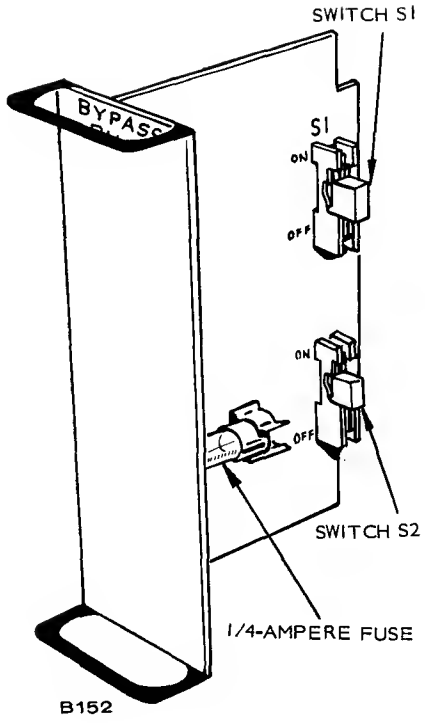


FIGURE 24. BYPASS PLUG MODULE

4. Insert the bypass module into position 7.
5. Reposition the operation selector switch and check operation of the automatic transfer switch.
6. Move the operation selector switch to "STOP" after the test is finished.
7. Remove the start-stop bypass plug module.
8. Reinstall module from Step 3 or install new module, if required.
9. Move the operation selector switch on engine control to "RMT."
10. Close cabinet door.

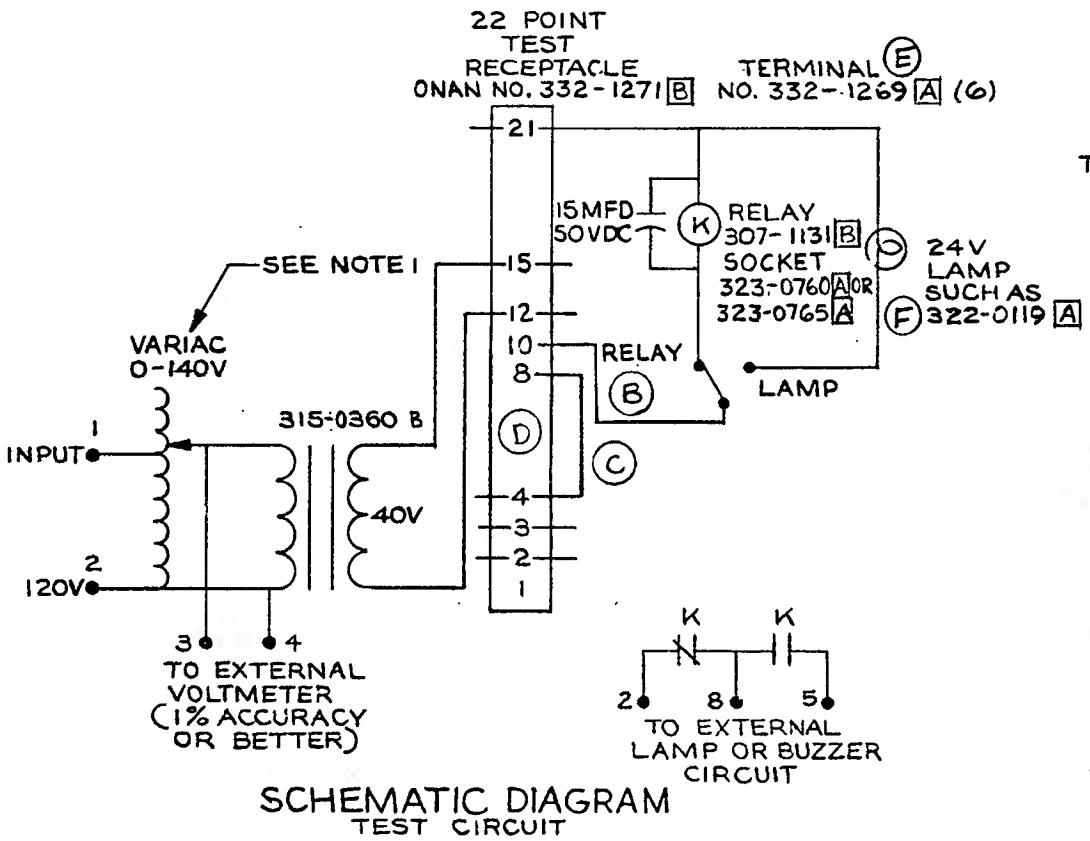
MODULE TEST PROCEDURES

The following drawings give test procedures for the individual modules. Note on the drawings that test circuits are usually required. If you find a module defective or the correct calibration cannot be obtained, replace it.

Module wiring diagrams are in Onan publication "WIRING DIAGRAMS AND PARTS LISTING" (number 962-0501).

539-0161

LET	REVISIONS	ZONE	ENG	CKR	DATE
A	REVISED		JV	CP	2-9-71
B	RELAY MOVED FROM # 6 TO # 10	C-3	J.P.	CP	2-5-72
C	JUMPER MOVED FROM # 6 TO # 5	C-3	J.P.	CP	
D	PINS # 5, 6, & 7 REMOVED	C-3	J.P.	CP	
E	WAS # 332A1267	D-2	HEM	CP	9-27-73
F	WAS # 332A119	C-2	HEM	CP	9-27-73



SCHEMATIC DIAGRAM
TEST CIRCUIT

NOTES:

1. VARIAC MUST BE SMALL SIZE WITH VERY SMOOTH CONTROL FOR FINE ADJUSTMENT OF VOLTAGE IN RANGE OF 90-140 VOLTS.

TEST PROCEDURE FOR VOLTAGE SENSOR 300-0780 D

1. SET % DIFF DROPOUT CONTROL TO 5%.
2. SET PICK-UP CONTROL TO MARK BETWEEN 110 & 120V. THIS IS 115V POSITION.
3. SET CALIBRATE CONTROL TO FULL CLOCKWISE POSITION WITH A NARROW BLADE SCREWDRIVER.
4. ENERGIZE TEST CIRCUIT AND ADJUST FOR 115 VOLTS INPUT.
5. SLOWLY TURN THE CALIBRATE CONTROL CCW UNTIL RELAY PICKS UP OR LAMP LIGHTS.
6. REDUCE INPUT VOLTAGE SLOWLY TO 80 VOLTS. RELAY SHOULD DROP OUT AT APPROXIMATELY 109 VOLTS.
7. SET PICK-UP CONTROL TO 90 VOLTS THEN SLOWLY INCREASE INPUT VOLTS TO SEE THAT RELAY PICKS UP AT 90 ± 2 VOLTS.
8. INCREASE PICK-UP VOLTAGE SETTING TO 140 VOLTS. RELAY SHOULD DROP OUT.
9. INCREASE INPUT VOLTAGE. RELAY MUST PICK UP AT 140 ± 2 VOLTS. DIAL MUST HAVE RANGE TO COVER 90 VOLTS TO 140 VOLTS. IF IT WILL NOT, IT WILL BE NECESSARY TO CHANGE CALIBRATE POINT SLIGHTLY.
10. DECREASE INPUT VOLTAGE SLOWLY, RELAY SHOULD DROP OUT AT APPROXIMATELY 133 ± 4 VOLTS.
11. INCREASE VOLTAGE TO 140 VOLTS. IF RELAY DOES NOT PICK-UP, ADJUST PICK-UP CONTROL UNTIL RELAY DOES OPERATE.
12. SET % DIFF DROPOUT CONTROL TO 20% THEN REDUCE INPUT VOLTAGE. RELAY SHOULD DROP OUT AT 112 ± 4 VOLTS.

ITEM	PART NO.	QTY.	DESCRIPTION OR MATERIAL

NEXT ASSEMBLY	SIMILAR TO
TOLERANCES UNLESS OTHERWISE SPECIFIED	DECIMALS
FRACTIONS ±	2 PLACE ±
ANGLES ±	3 PLACE ±

539-0161

MF	SA	COST	HSG	TP	50 RELAY	GD	PUR
MILL	CRANK	CK	PINCH	WELD	INSP	QC	PO

DESIGN APPROVED
SAMPLE RELEASE
PROD RELEASE JV 11-13-20
SEPIA FROM

DR JER | ENG JAMES VINT | CKR CP
DATE 10-16-70 | SC ~
MODEL | PATT NO

Onan DIVISION OF STUDEBAKER CORPORATION Minneapolis, Minnesota

TEST PROCEDURE

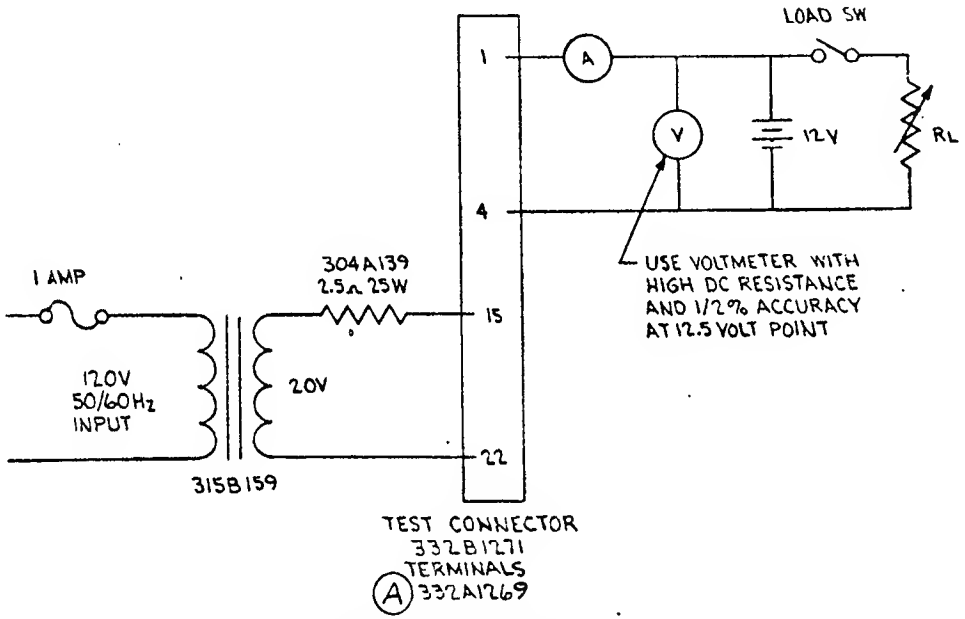
DWG NO. 539-0161 B

FORM 8C071

58

539-0163

LET	REVISIONS	ZONE	ENG	CKR	DATE
A	WAS # 332 A 1267	4-A			9-27-73



SCHEMATIC DIAGRAM
TEST CIRCUIT

TEST PROCEDURES

1 PLUG FLOAT CHARGER INTO TEST CIRCUIT

2 TURN CALIBRATE POT FULLY CLOCKWISE

3. CHECK OUTPUT CURRENT
APPLY 120V TO TRANSFORMER. OBSERVE CHARGE CURRENT AND VOLTAGE. CURRENT MUST EQUAL OR EXCEED 2 AMPERES AT 12.6 VOLTS. CLOSE LOAD SWITCH AND ADJUST RL TO INCREASE CURRENT IF VOLTAGE GOES ABOVE 12.6 WITH LESS THAN 2 AMPERES OUTPUT. OPEN LOAD SWITCH.

4. CHARGE BATTERY UNTIL VOLTAGE RISES ABOVE 15.0 VOLTS. TO MAKE SURE REG. COVERS 12.5 TO 15.0V RANGE.

5. FACTORY ADJUST
TURN CALIBRATE POT TO THE LEFT UNTIL THE CHARGE CURRENT DROPS TO ZERO WITH 13.3 VOLTS AT BATTERY TERMINALS FOR LEAD ACID BATTERIES OR 14.0 VOLTS FOR NICKLE CADMIUM BATTERIES. (UNLESS ORDER SPECIFIES SOME OTHER VOLTAGE).

6. PUT A SPOT OF GLYTOL OR PAINT ON THE POT SHAFT AND BODY TO SERVE AS A REFERENCE POINT

ITEM	PART NO.	QTY.	DESCRIPTION OR MATERIAL

NEXT ASSEMBLY	SIMILAR TO

TOLERANCES UNLESS OTHERWISE SPECIFIED

	DECIMALS
FRACTIONS ±	2 PLACE ±
ANGLES ±	3 PLACE ±

539-0163

MAT	SA	COST	MSG	TP	RELAY	GD	PUR
MEL	CRANK	CK	PUNCH	WELD	INSP	QC	PO

DESIGN APPROVED	DR JTM	ENG Jim Vliet	CKR
SAMPLE RELEASE	DATE 12-3-70		—
PROD RELEASE Jim Vliet	MODEL 2 AMP BATTERY FLOAT CHARGER		
SEPIA FROM			

Onan DIVISION OF STUDEBAKER CORPORATION Minneapolis, Minnesota

TEST PROCEDURE 12V

PATT NO

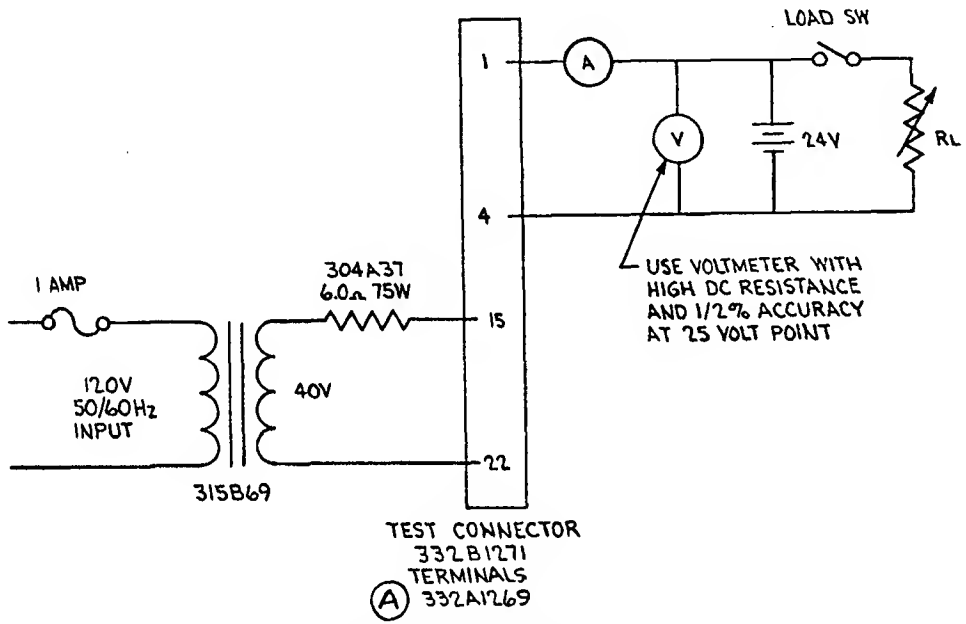
DWG NO 539-0163 B

FORM BC071

59

539-0164

LET	REVISIONS	ZONE	ENG	CKR	DATE
A	WAS # 332-1269	A-4			9-27-73



SCHEMATIC DIAGRAM
TEST CIRCUIT

TEST PROCEDURES

1. PLUG FLOAT CHARGER INTO TEST CIRCUIT
2. TURN FLOAT VOLTAGE ADJUSTMENT POT FULLY CLOCKWISE
3. APPLY 120V TO TRANSFORMER. OBSERVE CHARGE CURRENT AND VOLTAGE. CURRENT MUST EQUAL OR EXCEED 2 AMPERES AT 25.2 VOLTS. CLOSE LOAD SWITCH AND ADJUST RL TO INCREASE CURRENT IF VOLTAGE GOES ABOVE 25.2 WITH LESS THAN 2 AMPERES OUTPUT. OPEN LOAD SWITCH.
4. CHARGE BATTERY UNTIL VOLTAGE RISES ABOVE 26.6 VOLTS.
5. TURN FLOAT VOLTAGE ADJUSTMENT POT TO THE LEFT UNTIL THE CHARGE CURRENT DROPS TO ZERO WITH 26.6 VOLTS AT BATTERY TERMINALS.
6. PUT A SPOT OF GLYTOL OR PAINT ON THE POT SHAFT AND BODY TO SERVE AS A REFERENCE POINT.

ITEM	PART NO.	QTY.	DESCRIPTION OR MATERIAL

NEXT ASSEMBLY	539B163
SIMILAR TO	
TOLERANCES UNLESS OTHERWISE SPECIFIED	
FRACTIONS ±	DECIMALS 2 PLACE ±
ANGLES ±	3 PLACE ±

539-0164

MC	SA	COST	MSG	TP	RELAY	GD	PUR
MILL	CRANK	CK	PUNCH	WELD	INSP	QC	PO

DESIGN APPROVED
SAMPLE RELEASE
PROD RELEASE JV 4-20-71
SEPIA FROM

DR JTM ENG JTM VINT CKR J.W.D.
DATE 12-3-70 SC —
MODEL 2 AMP BATTERY FLOAT CHARGER

Onan DIVISION OF STUDEBAKER CORPORATION Minneapolis, Minnesota

TEST PROCEDURE 24V

PATT NO
DWG NO. 539-0164 B

FORM 8C071

5390188

SET	REVISIONS	ZONE	ENG.	CHK	DATE
A	WAS # 332A1267	2-B		V	9-21-72

TEST PROCEDURE

1. PLUG 12V BATTERY VOLTAGE SENSOR 300C796 INTO TEST CONNECTOR.

2. TURN "HIGH" ADJUSTMENT TO MAXIMUM (CLOCKWISE) POSITION AND "LOW" ADJUSTMENT TO MINIMUM (COUNTERCLOCKWISE) POSITION.

3. SET THE DC POWER SUPPLY VOLTAGE TO 12.3 ±.05 VOLTS.
   LAMPS DS2 AND DS4 SHOULD LIGHT.
   LAMPS DS1, DS3, DS5 AND DS6 SHOULD BE DARK.

4. TURN LOW ADJUSTMENT TO THE RIGHT OR CLOCKWISE UNTIL DS5 (LO BAT VOLTS) LAMP LIGHTS.
   LAMPS DS2, DS3 AND DS5 SHOULD LIGHT.
   LAMPS DS1, DS4 AND DS6 SHOULD REMAIN DARK.

5. VARY DC POWER SUPPLY VOLTAGE UP 0.2 VOLT AND DOWN 0.2 VOLT FROM 12.3 VOLTS.
   LAMPS DS3, DS4 AND DS5 SHOULD GO OFF AND ON AS VOLTAGE CHANGES.

6. TURN DC POWER SUPPLY VOLTAGE UP TO 13.7 ±.05 VOLTS.
   LAMPS DS2 AND DS4 SHOULD LIGHT.
   LAMPS DS1, DS3, DS5 AND DS6 REMAIN DARK.

7. TURN LOW ADJUSTMENT CLOCKWISE UNTIL DS5 LAMP LIGHTS.
   LAMPS DS2, DS3 AND DS5 SHOULD LIGHT.
   LAMPS DS1, DS4 AND DS6 REMAIN DARK.

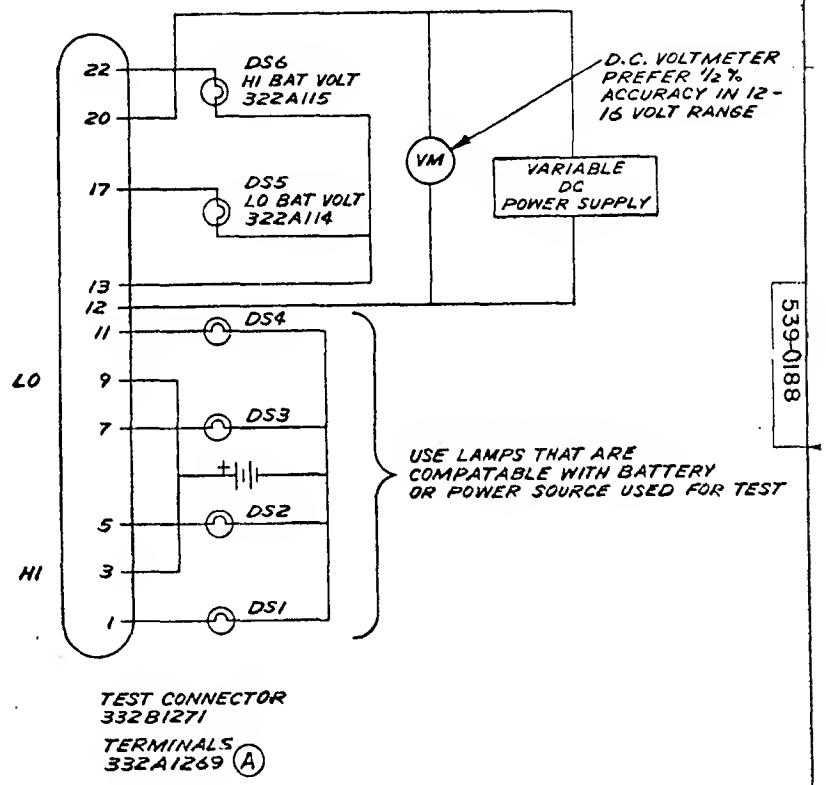
8. TURN HIGH ADJUSTMENT COUNTERCLOCKWISE UNTIL DS6 (HI BAT VOLTS) LAMP LIGHTS.
   LAMPS DS1, DS3, DS5 AND DS6 SHOULD LIGHT.
   LAMPS DS2 AND DS4 SHOULD BE DARK.

8. RAISE DC SUPPLY VOLTAGE TO 15.5 ±.05 VOLTS.
   LAMPS DS1, DS4 AND DS6 SHOULD LIGHT.
   LAMPS DS2, DS3 AND DS5 SHOULD BE DARK.

10. TURN HIGH ADJUSTMENT CLOCKWISE UNTIL DS6 GOES DARK.
    LAMPS DS2 AND DS4 SHOULD LIGHT.
    LAMPS DS1, DS3 DS5 AND DS6 SHOULD BE DARK.

11. VARY DC SUPPLY VOLTAGE UP 0.1 VOLT AND DOWN 0.1 VOLT FROM 15.5 VOLTS.
    LAMPS DS1, DS2 AND DS6 SHOULD GO ON AND OFF WITH VOLTAGE CHANGE.

12. MAKE FINAL FACTORY ADJUSTMENT.
    a) SET HIGH ADJUSTMENT SO DS6 LIGHTS AS DC SUPPLY VOLTAGE IS RAISED TO 14.5 VOLTS AND GOES DARK WHEN LOWERED TO 14.4 VOLTS.
    b) SET LOW BATTERY VOLTAGE SO DS5 LIGHTS AS DC SUPPLY IS LOWERED TO 12.8 VOLTS AND GOES DARK AS VOLTAGE IS RAISED TO 12.8 VOLTS.



539-0188

61

300C796	539C189	SEPIA FROM	ITEM	PART NO.			DWG SIZE	QTY	BULK	DESCRIPTION OR MATERIAL			
NEXT ASSY	SIMILAR TO	DR J.W. MORK		dwg	price	tp	pur	mo			DIVISION OF ONAN CORPORATION		
TOLERANCES UNLESS OTHERWISE SPECIFIED		CKR W.J.B.		weld	so	hsg	gd	qc			Minneapolis, Minnesota		
FRACTIONS ±	DECIMALS	ENGR JIM VINT		sec	punch	crank	ck	pu			TEST PROCEDURE		
ANGLES ±	3 PLACE ±	SAMP REL		DATE 6-16-72			SC —				BAT V SENSOR (12V)		
HOLES .004 .002	3 PLACE ±	PROD REL JV 6-20-72											
The proprietary design information on this print is owned by the Onan Division of Onan Corporation. Conveyance of this right is not extended to others.		PROD REL		ATSD & ATSE							539-0188		C

539-0188

539-0189

LET	REVISIONS			
A	WAS # 332A1267			

TEST PROCEDURE

1. PLUG 12V BATTERY VOLTAGE SENSOR 300C797 INTO TEST CONNECTOR.

2. TURN "HIGH" ADJUSTMENT TO MAXIMUM (CLOCKWISE) POSITION AND "LOW" ADJUSTMENT TO MINIMUM (COUNTERCLOCKWISE) POSITION.

3. SET THE DC POWER SUPPLY VOLTAGE TO 24.6 ± 0.1 VOLTS.
   LAMPS DS2 AND DS4 SHOULD LIGHT.
   LAMPS DS1, DS3, DS5 AND DS6 SHOULD BE DARK.

4. TURN LOW ADJUSTMENT TO THE RIGHT OR CLOCKWISE UNTIL DS5 (LO BAT VOLTS) LAMP LIGHTS.
   LAMPS DS2, DS3 AND DS5 SHOULD LIGHT.
   LAMPS DS1, DS4 AND DS6 SHOULD REMAIN DARK.

5. VARY DC POWER SUPPLY VOLTAGE UP 0.2 VOLT AND DOWN 0.2 VOLT FROM 24.6 VOLTS.
   LAMPS DS3, DS4 AND DS5 SHOULD GO OFF AND ON AS VOLTAGE CHANGES.

6. TURN DC POWER SUPPLY VOLTAGE UP TO 27.4 ±0.2 VOLTS.
   LAMPS DS2 AND DS4 SHOULD LIGHT.
   LAMPS DS1, DS3, DS5 AND DS6 REMAIN DARK.

7. TURN LOW ADJUSTMENT CLOCKWISE UNTIL DS5 LAMP LIGHTS.
   LAMPS DS2, DS3 AND DS5 SHOULD LIGHT.
   LAMPS DS1, DS4 AND DS6 REMAIN DARK.

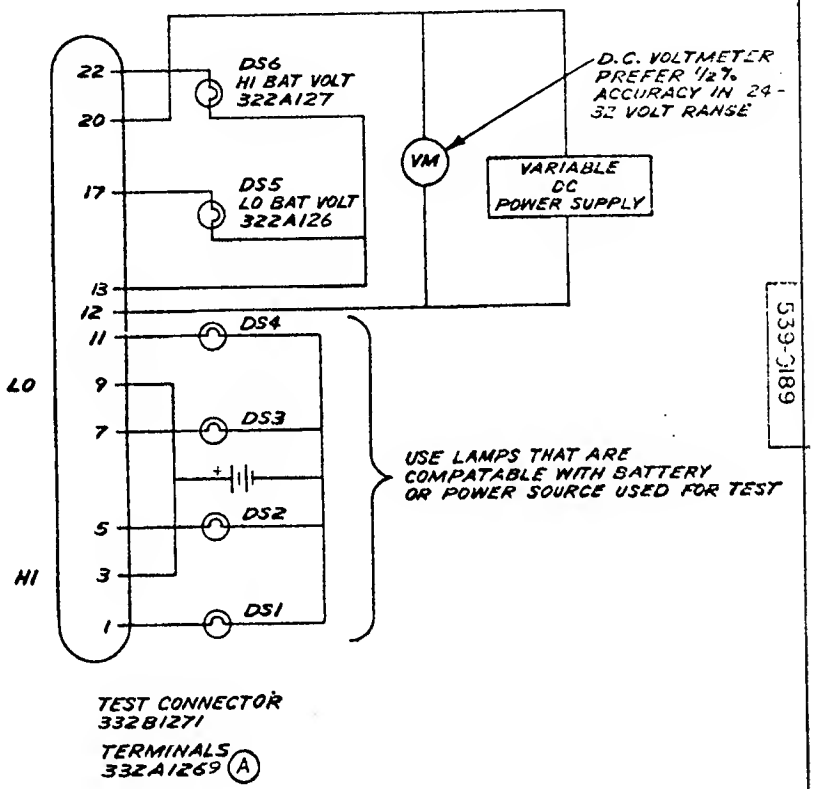
8. TURN HIGH ADJUSTMENT COUNTERCLOCKWISE UNTIL DS6 (HI BAT VOLTS) LAMP LIGHTS.
   LAMPS DS1, DS3, DS5 AND DS6 SHOULD LIGHT.
   LAMPS DS2 AND DS4 SHOULD BE DARK.

9. RAISE DC SUPPLY VOLTAGE TO 31 ± 0.1 VOLTS.
   LAMPS DS1, DS4 AND DS6 SHOULD LIGHT.
   LAMPS DS2, DS3 AND DS5 SHOULD BE DARK.

10. TURN HIGH ADJUSTMENT CLOCKWISE UNTIL DS6 GOES DARK.
    LAMPS DS2 AND DS4 SHOULD LIGHT.
    LAMPS DS1, DS3 DS5 AND DS6 SHOULD BE DARK.

11. VARY DC SUPPLY VOLTAGE UP 0.1 VOLT AND DOWN 0.1 VOLT FROM 31 VOLTS.
    LAMPS DS1, DS2 AND DS6 SHOULD GO ON AND OFF WITH VOLTAGE CHANGE.

12. MAKE FINAL FACTORY ADJUSTMENT.
    a) SET HIGH ADJUSTMENT SO DS6 LIGHTS AS DC SUPPLY VOLTAGE IS RAISED TO 29 VOLTS AND GOES DARK WHEN LOWERED TO 28.8VOLTS.
    b) SET LOW BATTERY VOLTAGE SO DS5 LIGHTS AS DC SUPPLY IS LOWERED TO 25.2VOLTS AND GOES DARK AS VOLTAGE IS RAISED TO 25.4 VOLTS.



539-0189

79

300C797	539C188
NEXT ASSY	SIMILAR TO

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONS ±
ANGLES... ±
HOLES... +.006 −.003
DECIMALS
2 PLACE ±
3 PLACE ±

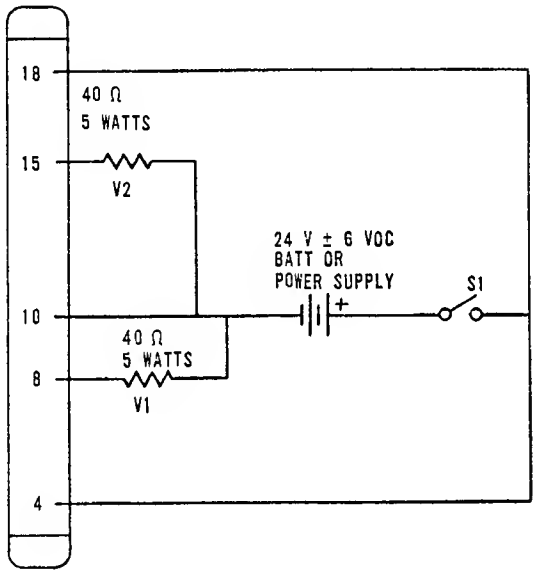
539-0189

SEPIA FROM	
DR J. W. MORK	
CKR WJB	
ENGR JIM VINT	
LAMP REL	
PROD REL JV 6-20-72	
PROD REL	

ITEM	PART NO.	DWG SIZE	QTY	BULK	DESCRIPTION OR MATERIAL
	relay price tp pur me				DIVISION OF ONAN CORPORATION Minneapolis, Minnesota
	weld so hsg gd qc				TEST PROCEDURE
	sec punch crank ck pa				BAT V SENSOR (24V)
DATE 6-16-72	SC				
MODEL ATSC		DRAWING 539-0189			REV C

539-0194 DWG SIZE B

LET	REVISION	ZONE	ENG	CKR	DATE
A	WAS 332A1267				7-27-72



TEST CONNECTOR
332B1271

(A) TERMINALS
332A1269

NOTES:

1. PLUG 24VTO 12 V CONV INTO TEST FIXTURE.
2. CLOSE SWITCH S1 TO APPLY 24 V ± 6 VDC.
3. V1 & V2 SHALL BE 13.4 V ± 1 VOC.

NEXT ASSY	SIMILAR TO
TOLERANCES UNLESS OTHERWISE SPECIFIED	
FRACTIONS ±	DECIMALS
ANGLES. . . ±	2 PLACE ±
HOLES. . . . + .006 − .002	3 PLACE ±

539-0194

SEPIA FROM

DR J. MORK
CKR WJB
ENGR
SAMP REL
PROD REL
PROD REL

ITEM	PART NO.	DWG SIZE	QTY	*BULK	DESCRIPTION OR MATERIAL
	95 Finish price tp pu- me				DIVISION OF ONAN CORPORATION Minneapolis, Minnesota
	weld sa hsg gd qc				TEST PROCEDURE (24V TO 12V CONVERTER)
	sec punch crank ck po				
	DATE 7-27-72 SC —				

MODEL ATSC, ATSD & ATSE

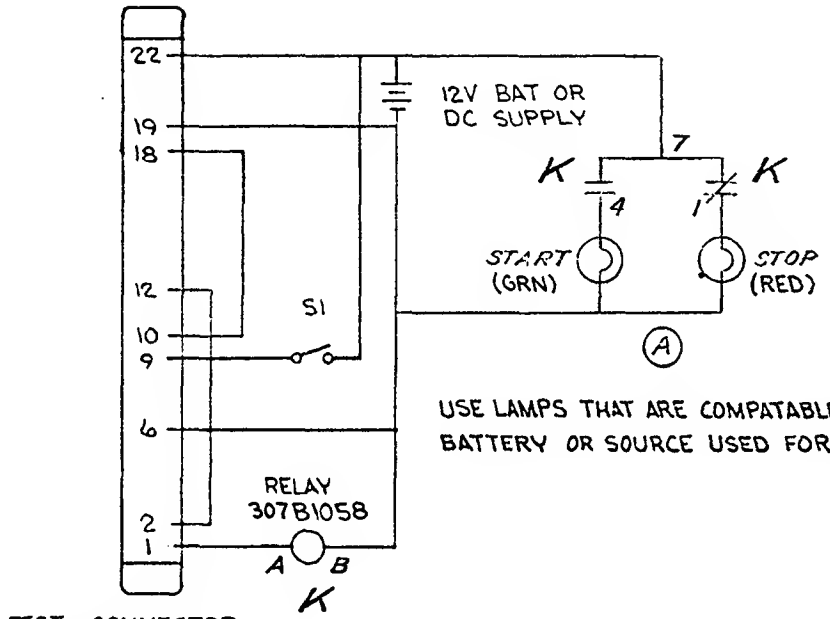
DWG NO. 539-0194

DWG SIZE B

FORM 86071

539-0195 DWG SIZE B

LET	REVISION	ZONE	ECR	DATE
A	ADDED TEST LAMPS	5-C		7-[illegible]
B	WAS #332 A 1267	4-A	1	9-27-73



TEST CONNECTOR
332B1271
TERMINALS
(B) 332A1269

USE LAMPS THAT ARE COMPATABLE WITH BATTERY OR SOURCE USED FOR TEST

NOTES:

1. PLUG 12 V T.D. START-STOP 300C921 INTO TEST FIXTURE.
2. APPLY 12 TO 15 VDC.
3. TURN BOTH START AND STOP ADJ TO MINIMUM (COUNTERCLOCKWISE POSITION).
4. MEASURE MINIMUM TIME DELAY.
   - 4.1 START:
     CLOSE SWITCH S1 AND MEASURE TIME DELAY BETWEEN SWITCH CLOSURE AND RELAY K PICKUP. TIME MUST BE LESS THAN 0.5 SECOND.
   - 4.2 STOP
     OPEN SWITCH S1 AND MEASURE TIME DELAY BETWEEN THE SWITCH OPENING AND RELAY DROP OUT. TIME MUST BE LESS THAN 0.5 MINUTES.
5. FACTORY SET TIME DELAY:
   - 5.1 START
     TURN START ADJ CLOCKWISE, CLOSE SWITCH S1, AND MEASURE DELAY. TIME MUST EXCEED 15 SECONDS, ADJUST FOR 2.5 ±0.5 SECONDS DELAY.
   - 5.2 STOP
     TURN STOP ADJ CLOCKWISE, OPEN SWITCH S1 AND MEASURE TIME DELAY. TIME MUST EXCEED 5 MINUTES ADJUST FOR 5 ±0.5 MINUTES.

300C921	539B196
NEXT ASSY	SIMILAR TO

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONS ±
ANGLES...±
HOLES....+.006 −.002
DECIMALS
2 PLACE ±
3 PLACE ±

539-0195

SEPIA FROM
DR JTM
CKR W.I.B
ENGR JIM YINT
SAMP REL
PROD REL JV 7-14-72
PROD REL

ITEM	PART NO.	DWG SIZE	QTY	* BULK	DESCRIPTION OR MATERIAL
	tabby price tp pur me / weld so hsg gd qc / sec punch crank ck po				

DATE 6-13-72 sc —

ONAN
DIVISION OF ONAN CORPORATION
Minneapolis, Minnesota

TEST PROCEDURE 12V
(START - STOP)

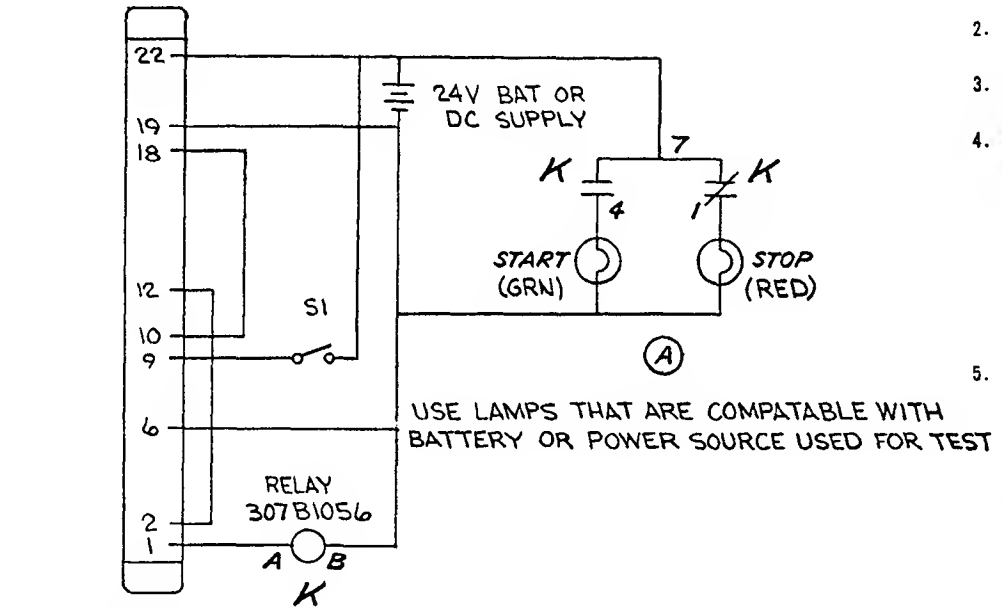
MODEL ATSC, ATSD & ATSE

DWG NO. 539-0195 DWG SIZE B

FORM 85071

539-0196 DWG SIZE B

LET	REVISION	ZONE	ENG	CKR	DATE
A	ADDED TEST LAMPS	3-C	[illegible]	VJB	7-6-72
B	WAS # 332A1267	4-A	[illegible]	CJ	9-27-73



TEST CONNECTOR
332B1271
(B) TERMINALS
332A1269

USE LAMPS THAT ARE COMPATABLE WITH BATTERY OR POWER SOURCE USED FOR TEST

NOTES:

1. PLUG 24 V T.D. START-STOP 300C922 INTO TEST FIXTURE.
2. APPLY 24 TO 30 VDC.
3. TURN BOTH START AND STOP ADJ TO MINIMUM (COUNTERCLOCKWISE POSITION).
4. MEASURE MINIMUM TIME DELAY.
   - 4.1 START:
     CLOSE SWITCH S1 AND MEASURE TIME DELAY BETWEEN SWITCH CLOSURE AND RELAY K PICKUP. TIME MUST BE LESS THAN 0.5 SECOND.
   - 4.2 STOP:
     OPEN SWITCH S1 AND MEASURE TIME DELAY BETWEEN THE SWITCH OPENING AND RELAY DROP OUT. TIME MUST BE LESS THAN 0.5 MINUTES.
5. FACTORY SET TIME DELAY;
   - 5.1 START
     TURN START ADJ CLOCKWISE, CLOSE SWITCH S1, AND MEASURE DELAY. TIME MUST EXCEED 15 SECONDS, ADJUST FOR 2.5 ±0.5 SECONDS DELAY.
   - 5.2 STOP
     TURN STOP ADJ CLOCKWISE, OPEN SWITCH S1 AND MEASURE TIME DELAY. TIME MUST EXCEED 5 MINUTES ADJUST FOR 5 ±0.5 MINUTES.

300C922	539B195
NEXT ASSY	SIMILAR TO

TOLERANCES UNLESS OTHERWISE SPECIFIED

FRACTIONS ±	DECIMALS
ANGLES...±	2 PLACE ±
HOLES....+ .006 −.002	3 PLACE ±

539-0196

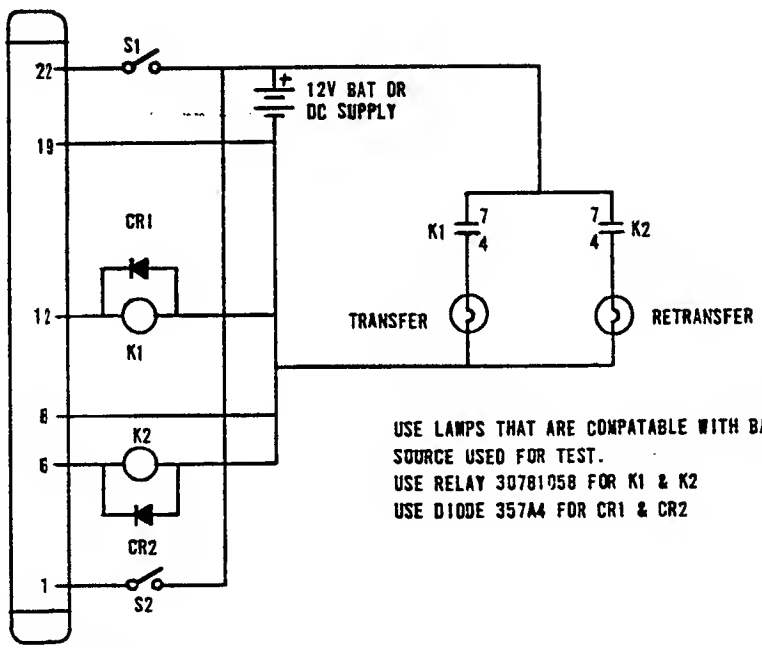
SEPIA FROM	
DR	JTM
CKR	WJB
ENGR	JIM VINT
SAMP REL	
PROD REL	JV 7-14-72
PROD REL	

ITEM	PART NO.					DWG SIZE	QTY	* BULK	DESCRIPTION OR MATERIAL
	054 relay	price	tp	pur	me				DIVISION OF ONAN CORPORATION Minneapolis, Minnesota
	weld	so	hsg	gd	qc				
	sec	punch	crank	ck	po				TEST PROCEDURE 24V (START - STOP)
DATE 6-13-72				sc —					
MODEL	ATSC, ATSD & ATSE					DWG NO	539-0196		DWG SIZE B

FORM BE071

539-0199 DWG SIZE B

LET	REVISION	ZONE	ENG	CKR	DATE
A	WAS # 332-1267	A-4	HK	CP	9-27-73



USE LAMPS THAT ARE COMPATABLE WITH BATTERY OR SOURCE USED FOR TEST.
USE RELAY 30781058 FOR K1 & K2
USE DIODE 357A4 FOR CR1 & CR2

TEST CONNECTOR
332B1271
TERMINALS
(A) 332A1269

NOTES:

1. PLUG 12 V T.D. TRANSFER 300C924 INTO TEST FIXTURE.
2. APPLY 12 TO 15 VDC.
3. TURN TRANSFER ADJ TO MINIMUM (COUNTERCLOCKWISE POSITION).
4. MEASURE MINIMUM TIME DELAY.
   - 4.1 TRANSFER
     CLOSE SWITCH S1 AND MEASURE TIME DELAY BETWEEN SWITCH CLOSURE AND RELAY K1 PICKUP. TIME MUST BE LESS THAN 0.5 SECOND.
5. FACTORY SET TIME DELAY:
   - 5.1 TRANSFER
     TURN TRANSFER ADJ CLOCKWISE. CLOSE SWITCH S1, AND MEASURE DELAY. TIME MUST EXCEED 15 SECONDS. ADJUST FOR 2.5 ±0.5 SECONDS DELAY.

NEXT ASSY	SIMILAR TO
	539-201
	539-200

TOLERANCES UNLESS OTHERWISE SPECIFIED

FRACTIONS ±	DECIMALS
ANGLES...±	2 PLACE ±
HOLES....+.004 −.002	3 PLACE ±

539-0199

SEPIA FROM	
DR J. MORK	
CKR W.J.B.	
ENGR JIM VINT	
SAMP REL	
PROD REL JV 7-27-72	
PROD REL	

ITEM	PART NO.					DWG SIZE	QTY	* BULK	DESCRIPTION OR MATERIAL
	DSC relay	price	tp	pur	mc				DIVISION OF ONAN CORPORATION Minneapolis, Minnesota
	weld	ss	hsg	gd	qc				
	sec	punch	crank	ck	po				TEST PROCEDURE 12 V (TRANSFER)
DATE 7-27-72				sc					

MODEL ATSC, ATSD & ATSE

DWG NO. 539-0199

DWG SIZE B

FORM 60871